Development of a framework for total quality management principles in the construction companies with special reference to the construction companies in the state of Qatar

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Development of A Framework for Total Quality Management Principles in the Construction Companies with Special Reference to the Construction Companies in the State of Qatar

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Abstract

An increased demand of quality in the construction industry has been a major cause of finding new systems and developing frameworks that are fit for purpose. Construction companies around the world are trying to increase their productivity and index of quality and they are developing new methodologies through research and development. Though innovation is, never completely good or bad and it is not easy to analyse the net effect. Theories and empirical research on materials, technology and innovation have been produced more than 100 years. In this, the framework for management and innovations of processes in construction industry has attracted the most interest, while other areas, such as the combination of technologies, construction companies' life cycles in Qatar and regulatory process have also been researched in detail.

This research work has identified and addresses the important issues related to the implantation of Total Quality Management (TQM) in the construction sector in the State of Qatar. The main aim of the study is to develop and present to the construction companies in Qatar a new model that could not only improve the understanding of Total Quality Management (TQM) within their sector, but also help in developing the processes, procedures and operations by employing TQM framework in all sections of a company.

Therefore, this thesis suggests a model based on existing and new quality management framework in Construction industry in Qatar. Furthermore, this thesis is a combination of the collected knowledge in different research traditions, and of observed studies of the Qatar Construction industry. The aim is to give a complete picture of the materials, technology, regulatory process and innovation and to provide a theoretical model, which can be used for existing and new management framework that may be implemented in the industry that has been referred as "client" in this study.

This study examined one of the largest construction companies in Qatar as a case study to identify the current status and to highlight current barriers faced by construction companies in the implementation of Total Quality Management (TQM) philosophy. European Foundation Quality Management (EFQM) elements, identified through the

TQM concept in the literature review, are used as a data collection framework while both the qualitative and quantitative methodologies are used to measure the level of perceptions among employees of the "client" construction company towards those elements. Moreover, the Critical Success Factors (CSFs) are reviewed based on previous studies in the literature review.

The findings of this thesis suggest that TQM can be successfully implemented among Qatar's construction companies. The conclusions and recommendations are drawn from the best practice of TQM implementation as a guideline for the client construction company to consider in adopting the TQM philosophy. Furthermore, a framework has been suggested for the Client recommending the actions the Client should take to establish and implement a TQM framework, which will increase productivity, stream line the processes and improves the quality of the services and the products offered by the client.

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Chapter 1 Nature of the Research

1.1 Background

The search for new management paradigms is not a recent phenomenon. Over a sustained period of time, many management writers and thinkers have continuously strived for better methods of achieving time, cost and quality objectives (Seymour and Low, 1990). In a study about the relationship between quality management practices and the performance of small and medium size enterprises (SMEs) in Ghana, Fening, Pesakovic, and Amaria, (2008) found support for the argument that quality management practices improve organisational performance in both large and small businesses in any part of the world.

Many authors and researchers have written papers regarding the theories and implementation of Total Quality Management (TQM) in different industries such as manufacturing and services, while few have focused on the construction industry. Therefore, this research provides an overview of the evolution and changes in the construction industry owing to modern technologies, the evolution of science and technological intuitiveness, which represent a norm in all industries. Moreover, no longer the role of the managers are only maintaining the order and daily routine, but they are responsible to drive the development and comprehensive changes and continual improvement to meet the needs of society and customers requirements.

Every organisation has different cultures, history, leadership, and style. Also, in an era of technological development, and globalisation there are huge demands from customers for better quality of work. In order to satisfy its customers, each organisation has to develop itself according to its capabilities, and customer requirements. So, this study provides some important issues associated with the implementation of TQM in the construction industry in State of Qatar. Moreover, the results of this research is not limited to the Qatar construction companies only, but can be applied in other countries where they have similar environment, such as some countries in the Middle East.

Effective organisational management requires data to support decision making. According to Gulledge and Chavusholu (2008) managers need data for measurement and control, similar to an aircraft pilot monitoring the cockpit displays (command, control and communications centre for that unit). The construction companies are one of those organisations who have a complicated system because the parties were involved in this companies activities usually are huge, therefore, the needs for proper system to manage and monitor all processes and guide the people becomes the priorities of those companies. Also, the tools used to measure quality is very important when they are used periodically to follow trends of the quality of service and to know what should be done to improve this service, through analysis of customers complains and suggestions.

Achieving the quality in the construction industry can not be achieved only through our knowledge of the wishes and needs of beneficiaries such as stockholders, customers (internal and external). In order to effectively improve the construction industry in proper and methodological way to fit the changes and developments that are imposed by the current era of globalization and information technology, all parties should participate and supporting to fulfil the Total Quality Management.

Researcher's experience in the construction industry is more than fifteen years, and it has been witnessed over the years that the problems faced by the construction industry have become clearer, bigger and increasing rapidly perhaps multiplying on daily basis. Thus, this research is directed towards identifying and developing a suitable TQM model, which may be adopted by construction companies aiming to solve or eliminate these problems. According to Reed, Lemak, and Mero (2000) TQM is an approach that their organisations use to serve their customers' ever-changing customer needs, and generate profits for their stakeholders. A growing number of organisations use quality management as a strategic foundation for achieving a competitive advantage.

1.2 Contributions of the Research

1- This research makes contribution to the construction industry in Qatar by identifying and offering solutions to the problems that are faced by construction companies in the implementation of TQM.

2- This research is the first study concerned with the subject of implementation of the TQM in construction industry in Qatar.

3- This research will add value to the construction industry in Qatar by offering TQM as a new management system concept within developing countries.

4- The outputs of this research may be employed as a tool that encourages the implementation of TQM in other industries in Qatar.

5- The results of this research will help the constructions companies' directors in Qatar to understand how to invest in and implement the concept of TQM more effectively, in order to develop and improve the performance of their tasks and processes.

1.3 Significance of the Research

This research focuses on the TQM in a context of the construction industry. The main rationale for the selection of this area for research is the role that the construction industry plays in the development of any country and economy through the provision and development of the infrastructure of the countries. The construction companies in Qatar play particularly significant role in developing the economy and represent a multi-billion dollar industry. There are small, medium and large size companies working on a range of projects and products, including domestic and international ones. However, there is lack of understanding of the quality systems and tools that could be implemented in the construction industry to improve not only the end products but also the processes and the overall system. There are a number of techniques, such as, six sigma, just-in-time and TQM that could be employed to fill that gap in the Qatar's construction industry. These techniques were already successfully employed in the Western economies. They were

used to improve the processes and products, ultimately resulting in more satisfied customers, which then lead to increased productivity and profitability of the companies.

I can state from my personal professional experience in construction companies in Qatar, that problems related to quality are multifaceted. Quality in the construction industry needs to apply to various areas such as workmanship, processes, and materials. Poor quality results in any of these areas can potentially lead to significant issues in the whole industry. In addition, having had some previous experience and knowledge of quality management, I made a connection between a TQM as a holistic or totality approach to quality which in my opinion represents a powerful way of solving the issues that we currently face in the Qatari construction sector. Moreover, continuous improvement cycle is a major element that needs to be built into the suggested framework. Therefore, it is important to adopt as system that offers a platform for this aspect to be incorporated and addressed. The emphasis of this research is on the theoretical contribution to the concept of TQM and its application in the construction industry in Qatar.

1.4 Research Objectives

The main aim of the thesis is to develop a framework for the implementation of TQM in the construction industry with special focus on the construction companies in the state of Qatar. In order to achieve previous aim following objectives emerged:

1. Understand the main principles, tools, techniques of TQM.
2. Achieved the main requirements of implementation TQM in construction companies.
3. Understand the current status of the construction industry in Qatar.
4. Identify the significant problems of the Qatar construction companies and provide rectification to them.
5. Identify the effectiveness of TQM principles that are implemented in construction companies in Qatar

1.5 Limitations of the Research

The limitations of the research are presented in this part as follow:

1. Only one Construction Company from construction industry in Qatar is employed as a case study.

2. The research focuses on the construction companies only, other types of companies within construction industry will not be discussed in detail.

3. Since the TQM as a topic is almost new in developing countries, and never been fully implemented in the construction industry in Qatar, the literature review is based on work done in the development countries such as UK and USA.

4. The data collected and interviews are limited to years of 2008 and 2009 only.

1.6 Research Questions

The research problem could be elaborated by the following main question:

"How can the situation be improved and problems rectified through the development of a model that is consistent with the construction industry situation in the State of Qatar in the light of the Total Quality Management philosophy"?

Therefore, the research questions are based on the main question, objective of the research and the literature review, are listed as follows:

- **Literature review Stage**

Question 1

What is Total Quality Management?

Question 2

What are the requirements for implementing TQM within the construction industry in general?

- **Interview Stage**

Question 3

What is the present situation of construction companies in the State of Qatar?

Question 4

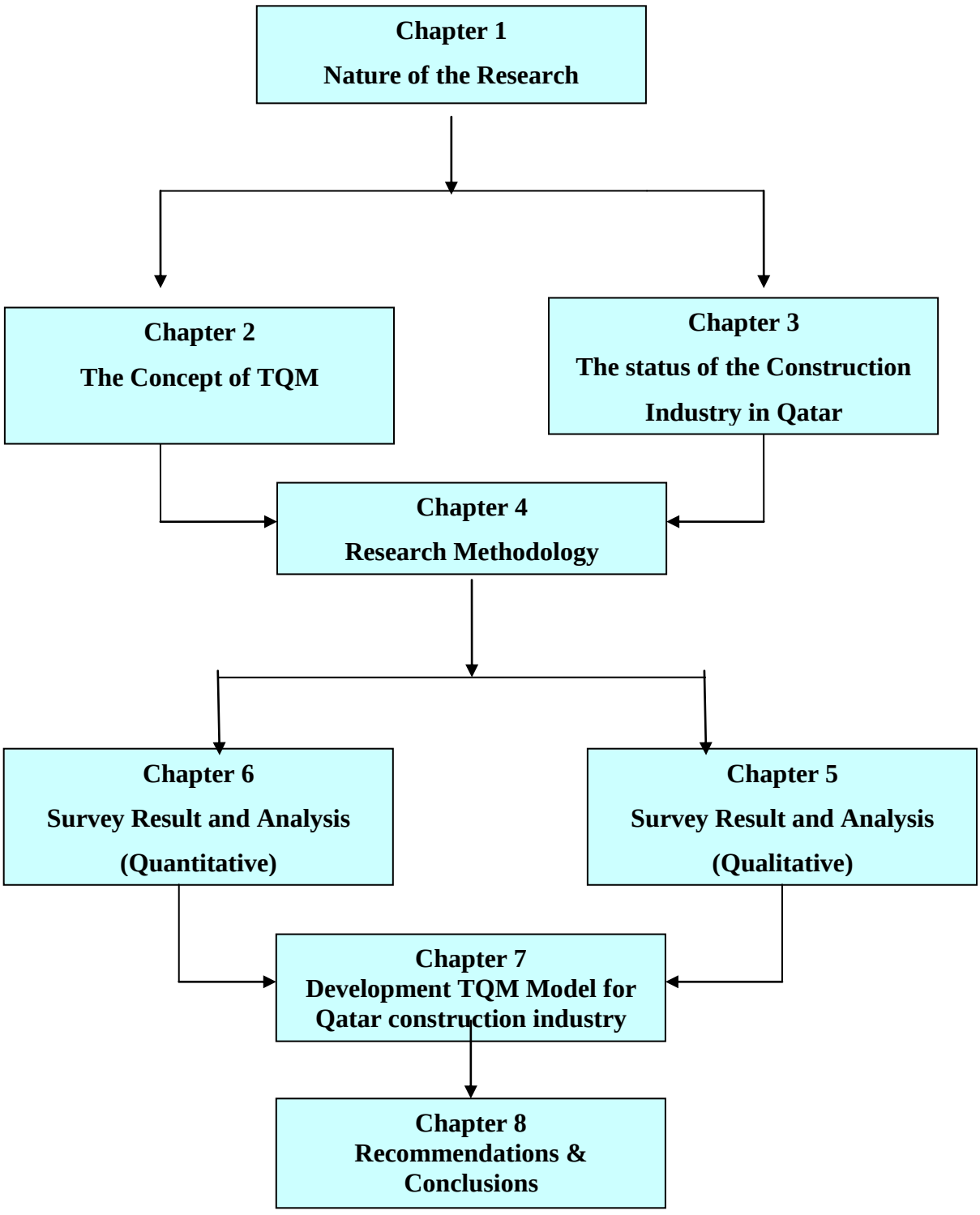
What are the critical problems faced by construction companies in the State of Qatar vis-à-vis the implementation of TQM?

- **Questionnaire Stage**

Question 5

How effective are TQM principles when implemented among construction companies in Qatar?

1.7 The Structure of the Thesis



1.8 Summary

This chapter described the nature of the research including the introduction to the subject and the important of quality in the construction industry, the limitation of the research, the contribution of the research and the significant of the research. Research objective and research questions are also covered in this chapter. The last part in this chapter was the structure of the thesis.

Chapter 2: The Concept of Total Quality Management

2.1 Introduction

Total Quality Management (TQM) is a system focusing on customer satisfaction through a concept of "continuous improvement". This concept emerged after the 1980s with the purpose of developing and expanding quality management strategy by adding more aspects related to quality. Most of the literature indicates that the interest in the TQM concept at the level of production began in USA was as only theories and implemented in practice in JAPAN after World War II in order to improve the quality of industrial production consistently and comprehensively. One of the major reasons the Japanese have been so successful in business is their ability to take a concept or idea from another culture and improve on it in a uniquely Japanese fashion (Alfred and Mike, 1986). The growing intensity of global competition, especially from Japan, led the US to follow Japanese strategy. This happened when Hewlett-Packard criticised US chips manufacturers for poor product quality compared with their Japanese competitors.

The TQM concept is one of the modern management concepts which helped to increase the competitiveness between organisations. This has resulted from the level of customer awareness which helps them to select a product or service of high quality and at a reasonable price. Electronic Business Magazine reported in (1992) that 91 % of 70 companies using TQM had indicated that, their quality had improved when compared with their competitors (Talha, 2004). In general, TQM is a way for managers to improve the effectiveness, flexibility, and competitiveness of a business as a whole.

TQM is considered by many researchers as an important approach in quality and business performance improvement, and therefore other industries are forcing the construction industry to adopt TQM. Pheng and Ann Teo (2004) discussed the implementation of TQM in construction firms, and concluded in their study that TQM has been recognised as a successful management philosophy in the manufacturing and service industries, so can likewise be embraced in the construction industry to help raise quality and productivity.

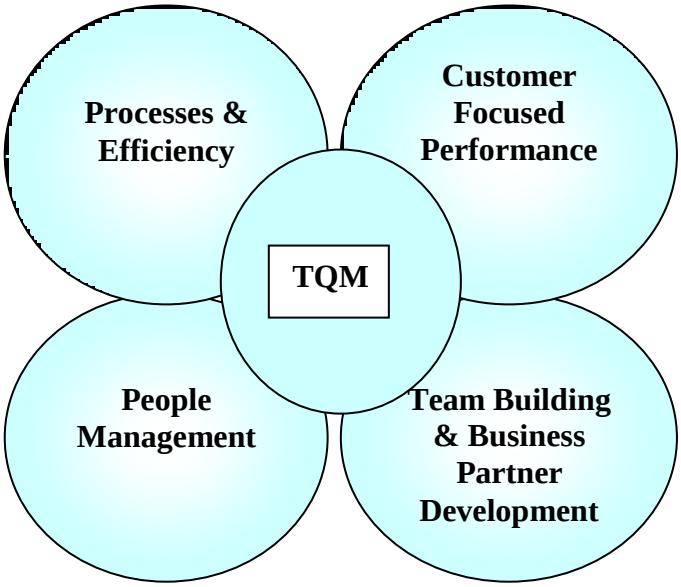
The United States and European industry are beginning to understand that poor quality costs companies a high amount in sales revenues nationally, and improving the quality of goods and services will help to improve productivity, lower costs and increase profitability. The United States and Europe have woken up little late, after the competitiveness of Japanese manufacturing in the early 80's. There is no doubt that most of Japanese products are better quality, and lower cost than US and European products, which may be a result of Japanese manufactures understanding the TQM concepts earlier than others.

Quality Assurance (QA) and Quality Control are both very critical terms. According to the Manual of Professional Practice for Quality in the Construction Project, "Quality Assurance (QA) is a program covering activities necessary to provide quality in the work to meet the project requirements. On the other hand Quality Control (QC) is the specific implementation of the QA program and related activities". (Arditi and Gunaydin, 1997).

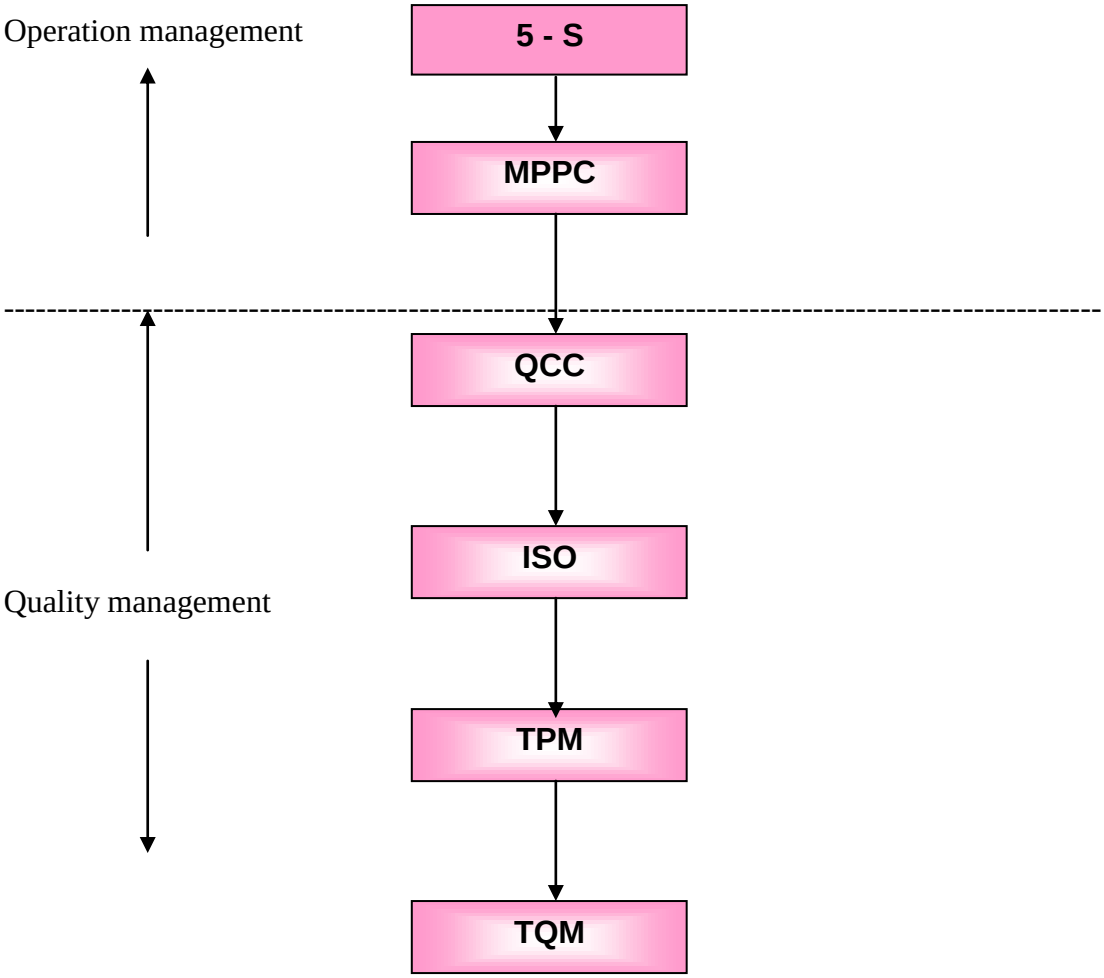
TQM system is an integrated system of methods, principles, and best practices that provide a framework for organisations to strive for excellence in the everyday process. To become a world class competitor, companies need a model to integrate continuous improvement tools into system that involves participative cross- functional implementation. The various models proposed by experts may support organisations in the TQM implementation process. There are some examples of some models which have recently been proposed. One is the TQM-efficient model (TQMEF), proposed by (Subhash and Narag, 2007), and aimed at recommending a TQM model for Indian organisations, as shown in Figure (2.1). A crucial element of TQM that has emerged is processes and efficiency. Without adequate attention to efficiency, there will be no product improvement and all TQM effort will be wasted. The TQM managers must keep an eye on cost and waste reduction, resources planning and utilization and above all safety to have a positive impact on society and growth of the organization. The main issue is focusing on customer satisfaction and making operation efficient.

The other is that of the Leicester Business School which developed a TQM Excellence Model, named 'LETQMEX', as shown in Figure (2.2), which aims at providing a step- by-step improvement opportunity for firms which are committed to satisfying customers better through TQM.

Figure (2.1): TQMEF (TQM-Efficiency) Model



Source: Subhash Kakkar and A.S. Narag, Recommending a TQM model for Indian organisations, The TQM Magazine Vol. 19 No. 4, 2007, pp. 328-353



Key:

5-S - Seiri, Seiton, Seiso, Seiketsu, Shitsuke

MPPC - Marketing, Production and purchasing control

QCC - Quality Control Circles

ISO - ISO 9000 Series

TPM - Total Productivity Maintenance

TQM - Total Quality Management

Figure (2.2): The LETQMEX MODEL

Source: Samuel K.M.Ho and Christopher K.H. Fung, Developing a TQM Excellence Model, the TQM Magazine 1994, pp. 24-30

2.2 Definitions of Quality

The simple definition of quality is meeting the customer requirements, Moreover, and aiming at increasing customers satisfaction, many organisations have focused on quality and reduced their costs to gain maximum customer satisfaction, examples of this being Toyota in Japan, Samsung in South Korea. According to (Foster, 2001 in Maguad, 2006) achieving customer satisfaction depends on not only how well and how thoroughly quality actions in the several areas of the organisation work individually but also on how well and how thoroughly they work together.

According to (Kusaba 1995, in Fukui et al. 2003), quality refers to the different workmanship of various activities. Consequently each business or activity has a different definition of quality, for example in sales the term quality is more focused on the services which are provided to customer, while in manufacture, the term quality is more focused on the production process, and in construction, quality refers to both of services provided and outputs.

According to BS 4778: (1987) international terms stated that quality is "The totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied needs". To clarify this definition further, quality is present when the products or service produced are within the customer requirements.

The American Society for Quality Control defines quality as "the total features and characteristics of a product or service made or performed according to specification to satisfy customers at the time of purchase and during use" Talha, (2004). The emphasis in this definition is that the quality is achieving the specification.

According to Hradesky (1995, in Fukui et al. 2003), quality is determined by the customer and the marketplace and includes all the product's attributes. Quality includes everything that the client expects and requires and is continuously changing. The definition considered the customers who guide the quality, and changeable according to customer requirements.

Mukherjee (2006) indicates that quality satisfies three Fs- Fit, Form and Function. This is a conventional definition of ‘quality’ which is basically confined to a product satisfying the need for the required dimensions, fitment, required form and aesthetics. The product should also be able to fulfil the functions desired to be performed by the product.

From the above definitions, one can conclude that quality is more than a tool or issue used to gain competitive advantage for businesses because it is a matter of survival. So, most of the quality concepts which mentioned above are focuses on providing a product that satisfy and meet the customers’ needs. Quality is therefore extremely necessary for the organisations to ensure that they have delivered their products or services according to the customer expectations and requirements. Moreover, each person has his or her own concept of quality and it is very difficult to give specific definition for quality, but there is no doubt and everyone can agree that, quality is perfection through control, accuracy, and completeness in work. Therefore, the varieties in quality definitions emphasis the Hradesky study in (1995), as he stated that there is no single definition of quality that will apply to all companies in all industries.

2.3 Quality Past vs. Present

Quality has existed from the earliest decades as behaviour, so we can refer to quality as anything prepared or manufactured with a degree of "excellence" or as the worth of a product or service. For more than 25 years, there have been many changes towards improved quality. As shown in Table (2.1), each civilisation has implemented a part of the concept of quality, but this knowledge started in the USA, and particularly in manufacturing sectors. This improvement can be seen in quality of product, leadership and management.

Table 2.1: Changing View of Quality

Past	Present
Quality is the responsibility of blue collar workers and direct labour employees working on the product	Quality is everyone's responsibility, including white- collar workers, the indirect labour force and the overhead staff
Quality defects should be hidden from the customers and management	Defects should be highlighted and brought to the surface for corrective action
Quality problem lead to blame, faulty justifications and excuses	Quality problems lead to cooperative solutions
Corrections- to quality problems should be accompanied with minimum documentation	Documentation is essential for "lessons learnt" so that mistakes are not repeated
Increased quality will increase project costs	Improved quality saves money and increases business
Quality is internally focused	Quality is customer focused
Quality will not occur without close supervision of people	People want to produce quality products
Quality occurs during project execution	Quality occurs at project initiation and must be planned for within the project

Source: Kerzner, H, (2003), Project Management: A system approach to planning, scheduling & control, 8th edition.

The key issues could be extracted from comparison in Table (2.1) that the quality today is everyone responsibly focusing on the customer requirements and is the way of increasing profits by improving products quality.

2.4 Quality Circle

A quality circle is a group of employees from the same work area and doing similar type of work voluntarily meet for an hour periodically either every week or fortnightly to identify, analyze and resolve work related problems in their own area. Zetie (2002), mentions that quality circles are a voluntary gathering of group of employees with an interest in solving a problem of mutual concern to them.

The structure of a quality circle is headed by the top management who has the responsibility to form the steering committee known as the quality council who in turn are responsible for monitoring all important activities in the organisation. The facilitator is the head of the coordinating agency which implements the quality circle. The non-members are the specialists in a particular area as detailed in Figure (2.3)

1-Top management
2-Steering Committee
3-Facilitator
4-Leader +Dy. Leader
5-Members
6-Non-member

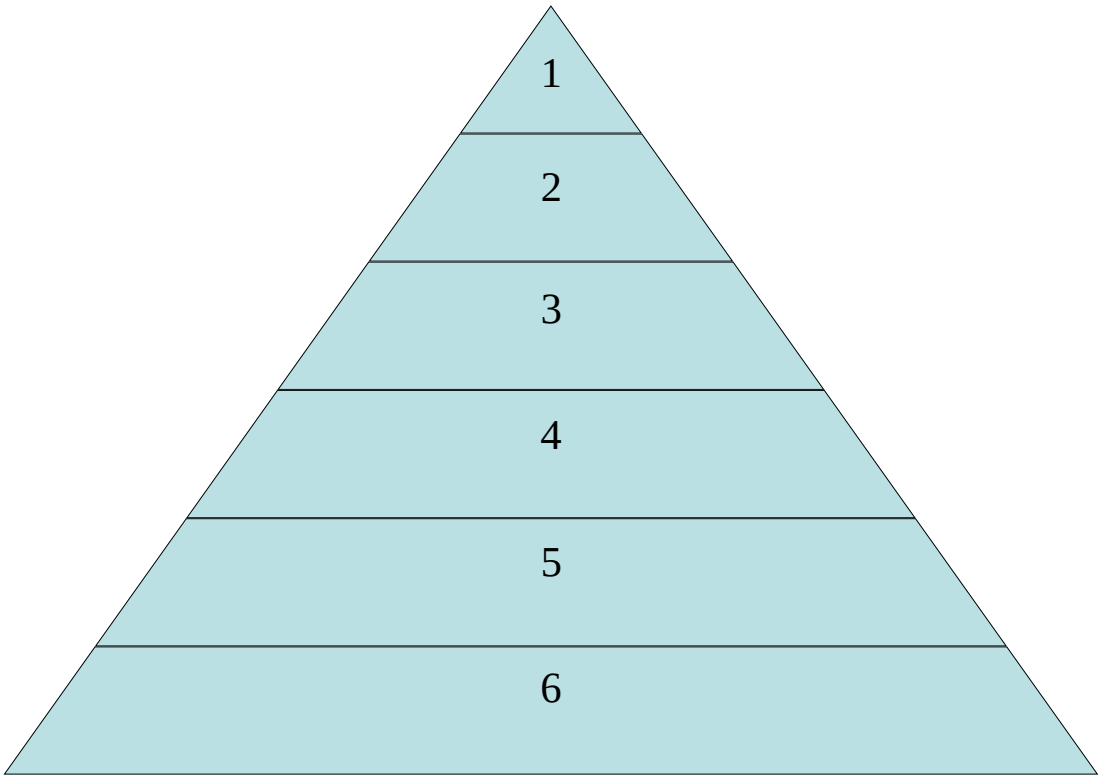


Figure (2.3): Structure of Quality Circle

Source: P.N. Mukherjee. Total Quality Management 2006 Prentice- Hall of India private Limited, New Delhi

2.5 An Over view of Total Quality Management (TQM)

2.5.1 The Historical Development of TQM

The term TQM, is widely used and developed around the world. Martinez, et al. (1998), mentioned that the concept of total quality was developed through the huge evolution of quality took place in the United States. According to Zairi (2007) TQM was "coined" in the first instance in the US military. Defenders of TQM diffused the concept through business consultancies in Western countries, and its influence spread from manufacturing to the construction and service industries and finally to education (Ishikawa, 1985). Feigenbaum (1993 in Hossain et al., 2010) identified the following six phases in the evolution of quality:

- **Operator Quality Control**

Operation quality control existed before the 19th century. During that period, each worker or group of workers was responsible for the manufacture of products, so in this way, the quality of a product could be better controlled because the workers focused on their work only.

- **Foreman Quality Control**

Mass production was the main reason for the emergence the foreman quality control, which was developed between 1900 and 1918. Mass production is characterised by the division of labour, specialisation of skills and standardisation. The classical management approach known as the scientific management method was initiated by Fredrick Taylor and became very popular. The foreman grouped the workers performing similar tasks under his/her supervision and he/she took full responsibility for the quality of all works done by the group.

- **Inspection Quality Control**

The phase of inspection or testing quality control was developed during the World War I. By World War II, the manufacturing system had become more complex and large numbers of workers were reporting to each foreman who could quite easily have lost control of the work. As a result, it was necessary to engage full- time quality inspectors. Quality inspection was adopted to separate non-conforming parts, and so the term "quality" meant inspection, and usually quality inspected during the production process itself

In this era of mass production, all finished products were examined for defects to ensure quality. Kanji and Asher (1993) stated that quality management started with simple inspection-based systems in which the product is inspected and compared with specified requirements to check its conformity. This means, quality measurement at that time focused on the inspection process by eliminating bad products, and depended on random inspection.

- **Statistical Quality Control**

During the period between 1937 and 1960, statistical quality control reached its peak. There became an increased need for quality inspection in the late mass production era because the volume and variety of components increased dramatically. Owing to the huge costs involved in quality inspection, Taylor's scientific management approach became inappropriate. Statistical quality control concentrated on statistical tools and made the quality inspection department more efficient contributing most in sampling inspection rather than complete inspection. Its slow growth was not due to its development of technical and statistical ideas material control, design control and business ability.

- **Total Quality Control (TQC)**

The TQC phase started in the 1960. Feigenbaum was the first expert who used the TQC term. He considered that "control must start with the design of the product and end when the product has been placed in the hands of customers who remain satisfied". There are

many elements such as supplier development relationships, people empowerment and teamwork that are considered as a part of the TQM concept, but not included in TQC.

- **Total Quality Management (TQM)**

TQM evolved in the 1980s and began to have a major impact on management and engineering approaches to long-term success through customer satisfaction. It is based on the participation of all members of an organisation in improving processes, products, service and the culture in which they work. Garvin (1984) outlined the evolution of TQM as the outcome of four major eras of development. He illustrates the evolutionary process where quality has moved from an initial stage of inspecting, sorting and correcting standards to an era of developing quality manuals and controlling process performance. The third stage regards comprehensive manuals including areas of an organisation other than production, and the use of standard areas of an organisation other than production, and the use of standard techniques such as statistical process control (SPC). Martinez-Lorente et al. (1998) summarized the chronology of TQM development as in Table (2.2).

Table 2.2: Important Events in the Development of TQM

Year	Events
1924-32	Hawthorn's studies demonstrated the importance of the social and psychological climate in work.
1924	Shewhart developed statistical process control. (SPC)
1926	Bell Telephone began to apply statistical process control methods.
1940s	US army pushed the use of sampling methods during World War II.
1950s	Many attempts at work improvement undertaken (e.g. job enrichment, work re-design, participative management, quality of work life, worker involvement).
1950	Deming's first visit to Japan.
1951	Creation of Deming Application Prize in Japan. First edition of Juran's Quality Control Handbook published.
1954	Juran's first visit to Japan. Maslow's theories about human needs.
1960	Liberalisation of economy in Japan with pressure to improve quality to compete with foreign companies. McGregor's X and Y theories.
1961	First edition of Feigenbaum's Total Quality Control published.

1962	The idea of quality circles appeared in the first issue of the Japanese Journal Quality Control for the Foreman.
1970s	The pressure of Japanese companies began to be felt in US companies.
1972	QFD was developed at Mitsubishi's Kobe shipyard.
1973	After the 1973 oil crisis the JIT system was adopted by a vast number of Japanese companies. A small number of US and European companies began to apply this system in the 1980s.
1974	Quality circles began to be widely introduced in the USA; the first quality circle programme was launched in Lockheed in 1974 and in the UK Rolls-Royce introduced the concept in 1979.
1979	First edition of Crosby's Quality is free published. Xerox Corp. started to apply benchmarking concept to processes. Publication of the BS5750 quality management series.
1980	An NBC television documentary about the "Japanese miracle" proposed Deming as a key element in this miracle.
1981	Ouchi's Z theory
1982	First edition of Deming's Quality, productivity and competitive position published.
1983	"Quality on the line", published by Garvin in Harvard Business Review, analysed the differences between Japanese and US companies, showing some of the reasons for the better performance of the Japanese. A paper about Taguchi's design of experiments was published in Harvard Business Review.
1985	Navel System Command named its Japanese- style management approach "total quality management".
1986	First edition of Deming's Out of the Crisis published. It became a bestseller.
1987	First edition of ISO 9000 quality management system series. Publication of the Malcolm Baldrige National Quality Award.

The Quality Control aimed to prevent the defects, Oakland, and Marosszeky (2006) define quality control as "essentially the activities and techniques employed to achieve and maintain the quality of a product, process, or service. It includes a monitoring activity, but is also concerned with finding and eliminating causes of quality problems so that the requirements of the customer are continually met". To simplify this definition one can say, Quality Control means a set of activities and methods used to complete quality requirements, by registering, analysing and writing all reports about information related to quality, so this information is the basis when making decisions related to quality, and although quality control is more sophisticated than mere entrance to inspection.

The historical development of quality as a management concept demonstrates that its evolution did not occur abruptly in sudden changes in management philosophy, but gradually through stable consistent improvement. This reflects a series of management innovations that were created during the twentieth century. Therefore, the TQM movement was not formulated as a separate philosophy, but derived from previously established scientific management concepts.

2.5.2 Definitions of Total Quality Management

Most of the writers on TQM have their own definition, so TQM is one of the most popular modern management concepts. For the past 25 years, most governments and organisations have implemented a TQM concept.

BS5750: British Standard (BSI, 1992) defines TQM as follows: "TQM is a management philosophy and company practices that aim to harness human and material resources of an organisation in the most effective way to achieve the objectives of the organisation". According to Asian Institute of Technology (AIT), TQM is “a philosophy that strengthens the culture to foster continuous organisational improvement through systematic, integrated, consistent effort involving everyone and everything, focusing primarily on total satisfaction of internal and external customers, where employees work together in teams with process ownership, guided by a committed top management, which takes a proactive participation”. (Nukulchai, 2003). Also, according to Wessel & Burcher (2004), the British Quality Association defines TQM as “an all-embracing business management

philosophy focusing on completely fulfilling customer requirements with a maximum of effectiveness and efficiency".

The above definitions define the TQM as a philosophy but from different point of view. British Standard described the TQM as the management philosophy aimed to achieve organisation objectives. While, the Asian Institute of Technology (AIT), defined the TQM as the philosophy aiming to satisfy the customers. The critical phrases in British Quality Association definition towards TQM is a management philosophy aiming to meeting the customer requirements. Therefore, the common word towards TQM concept is a philosophy.

The British Railway Board defines TQM as "the process, which seeks to meet and satisfy customer requirements throughout the whole chain of internal and external customers and suppliers" whereas the Royal Mail defines it as "A comprehensive way of working throughout the organisation, which allows all employees, as individuals and as teams, to add value and satisfy the needs of customer". The critical word toward the TQM definition is the process and way of working.

A definition by the US Department of Defence that succinctly captures the essence of the concept is: "TQM utilizes both quantitative (technical) methods and human resource (behavioural) practices to improve material and service inputs, intra-and inter organisational processes, and to sharpen the focus on meeting customers' needs (Singh and Smith, 2004).

The researcher view toward the concept of quality is the leadership and excellence in doing things. The priority of leadership means responding to customer requirements. Excellence means perfection of control and accuracy in daily activities and responsibilities. TQM is a broader philosophy and organisation planning toward achieving excellence in any activity or service they provided through the concept of continuous improvement.

Out of all definitions, a simple definition of TQM is a meeting of internal and external customer requirements, and the main difference between quality and TQM is that the quality term usually focuses on a temporary process. An example is in construction, in

order to obtain a proper strength for concrete according to the specifications, it should be cured by water for 3-4 days, until the required quality is achieved, so this is a temporary process, while TQM is a long term process and adopts a strategic dimension, to guide each production, financial, marketing and administrative plan in the direction which support the strategic dimension. In the light of the previous definitions, the researcher concluded that the definition of TQM is not a new concept, but in recent years it appears as an official job.

2.6 Previous Research on TQM

Oakland (1994), reported that three important components should be considered in order to implement TQM, these are a documented quality system, teamwork and the use of improvement tools and techniques. Moreover, Hellston and KlefsjÖ (2000) emphasise on Oakland study. They discussed TQM as a management system consisting of the three interdependent components: values, techniques, and tools. Techniques and tools support the values and together they form a whole. Moreover, they said, the implementation of TQM should begin with the identification of core values that should characterise the organisation. The next step is to distinguish techniques that are suitable and support the core values. Then, in order to support the techniques found to be suitable, tools must be identified and used in an efficient way.

From research aiming towards developing a framework for implementing TQM in the construction industry in Bahrain, Al-Sehali, (2001) demonstrated that Total Quality Management has become one of the best solutions to overcome construction industry's problems, and specification could be used as a gateway to introducing TQM to the construction industry.

A study by Love, et al. (2004), various construction companies are dismissive about implementing TQM in order to reduce quality problems in their projects because it is not uncommon for them to consider TQM to be synonymous with quality assurance (QA).

Research performed by Rao et al. (2004), TQM becoming more than a way of saving a company by increasing profitability in a short term. In addition to that, TQM companies enjoy cost- efficiency, flexibility and responsiveness.

A comprehensive survey was carried out by Delgado and Aspinwall (2005), aimed at determining whether the use of improvement tools in the construction industry are an important aspect of continues improvement. Result showed that, in terms of use, quality, performance measure, and technology tools are common practice in the industry.

Results of a study carried out by Arawati (2004), aimed to identifying the relationship between TQM and overall performance, show there is a strong and positive association between TQM, overall performance and customer satisfaction and suggest that an emphasis on quality would result in organisation gains.

The previous studies regarding TQM considered the concept of the TQM as one of the best solutions to overcome the construction industry problems. Moreover, many studies focus on importance of the tools and techniques in implementation TQM philosophy.

2.7 Quality Concepts from Quality Gurus

2.7.1 Walter A. Shewhart

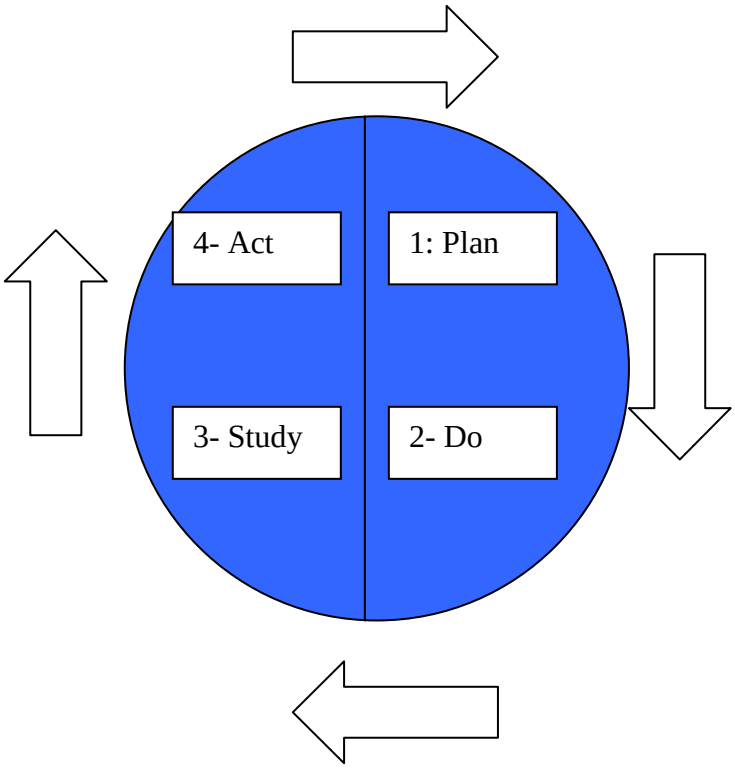
Walter A. Shewhart (1891-1967) who is regarded as the father of contemporary quality control, identified problems which existed in production and linked them with the rejection of a product by the customer, Shewhart established the cycle for learning and improvement as in Figure (2.4) – the quality management concept and tool. Moreover, the AT&T Company in Chicago is the first company which utilised quality concepts for product improvement.

Walter Shewhart in the USA during the 1920s and with the Bell Laboratories paid attention to the TQM concept through statistical process control (SPC). The design of the plan-do-check-act cycle was the scientific method to improve the work process. In addition to this Shewhart's concern was to develop a system to measure variables in

production. His early work on the statistical control processes and the control chart established a foundation for the quality of management movement.

Shewhart's emphasis on the need for statistical analysis to create an adequate understanding of work processes was clearly seminal for grasping the essence and causes of variation, both controlled and uncontrolled, (Bank, 1992 in Twaissi, 2008).

Figure (2.4): The PDSA Cycle



2.7.2 Deming's Philosophy

Deming (1950), who transferred statistical process control to Japan after the First World War, and taught the Japanese the concepts and techniques of quality, that facilitated to rebuild their economy and modified the performance of whole sectors.

The theoretical essence of the Deming management method concerns the creation of an organisational system that fosters cooperation and learning and facilitates the implementation of process management practices. This in turn leads not only to continuous improvement of processes, products, services, but also to employee fulfilment,

both of which are critical to customer satisfaction and ultimately, to firm survival. (Anderson et al., 1994 in Lawrence 2000)

Deming stated "Quality should be aimed at the needs of the customer, present and future". According to Deming, the foundation of quality management is reducing the variation in products and then improving the average. His management philosophy improved from observing how the Japanese mixed their teachings on quality control with Japanese culture to create a huge economic kingdom.

Deming, (1986) proposed 14 points as the principles of TQM, Rungtusanatham, Jeffrey and Bin Wu (2003), stated that these 14 points should provide a cure for the "seven deadly diseases" and help organisations to overcome the obstacles to producing and delivering high quality products and services.

2.7.3 Feigenbaum's Philosophy

Feigenbaum (1961) was the first who proposed the total approaches to quality issues. His philosophy was that quality is not implemented in a particular area, but must be implemented in totality for all management levels of the organisation. Feigenbaum defined total quality as an effective system to ensure production and service at the most economical levels that allow customer satisfaction. He claimed that quality means the best for customer use and selling price, and effective quality management includes of four steps:

- Setting quality standards
- Appraising conformance to these standards
- Acting when standards are exceeded
- Planning for improvements in the standards

This control process is more suitable for TQM, as it includes the improvement dimension. However, it does not incorporate the TQM culture, nor does it stress customer satisfaction and management responsibility.

2.7.4 Juran's Philosophy

Juran (1970), an early doyen of quality management, emphasised that the focusing on statistical process control is not enough, so his philosophy was that quality must be adopted by the top management and they responsibility of diffusing the quality concepts. In addition to this, and aimed at increasing product quality, he used another principle, which focuses on customer and human resources, Juran therefore defined quality as "Fitness for purpose or use", Moreover, Juran focused on management rather than on workers because managements are responsible for most quality problems. Table (3.3) sets down major points of Juran's quality management philosophy, as he defined a universal sequence of activities for the three quality processes.

Table 2.3: Universal Processes for Managing Quality

Quality Planning	• Identify who are the customers. • Determine the needs of those customers. • Translate those needs into our language. • Develop a product that can respond to those needs. • Optimize the product features so as to meet our needs and customer needs.
Quality Improvement	• Develop a process which is able to produce the product. • Optimize the process.
Quality Control	• Prove that the process can produce the product under operating conditions with minimal inspection. • Transfer the process to Operations.

According to Juran (1988), the quality trilogy consists of three basic managerial processes through which the management of an organisation can achieve quality:

1. Quality planning provides the operating forces with the means of producing products that meet consumer needs.

2. Quality improvement is based on looking for opportunities to improve quality before problems arise.
3. Quality control emphasises the prevention of quality problems and the correction of defects to create a product that is free from deficiencies.

2.7.5 Crosby's Philosophy

Crosby (1980), an American consultant, defined quality as "conformance to requirement". From his definition the word "requirement" is broader than specification, and goes beyond meeting specifications. Crosby explained his view which is related to a successful quality improvement program.

The Crosby's approach described the measurement of the Cost of Quality (COQ), which includes any costs that are attributable to achieving quality and focuses on the price of both conformance and non-conformance. According to Crosby, price of conformance represents about 3-4 percent of sales in well-run companies, and on the other hand, the price of non-conformance represents between 20-35 percent. Quality in Crosby's approach is conformance to requirements and quality is free.

2.7.6 Ishikawa's Philosophy

Ishikawa (1985) argued that quality management should extend beyond the product manufactured or service provided to post-sales service. The Japanese realised that since quality must permeate the entire company, it cannot be entrusted to just one department. Instead, it must be the centre of attention for top management (Ishikawa, 1985). He emphasised that the term quality means quality of product, service, and management- in fact the company itself. Also, he established an idea of the "internal customer", the next person in the process, and he paid attention to statistical tools, used in organisations, describing these tools as "indispensable for quality control" (Bank, 1992), and consisting of:

- Pareto chart
- Cause and effect diagram (Ishikawa diagram);
- Scatter diagram

- Histogram
- Check sheet
- Control chart
- Stratification

2.7.7 Concept by TQM Expertise

Oakland (1989) defined TQM as "a way of managing to improve the effectiveness, flexibility and competitiveness as a whole". Basically it is a way of planning, organising and understanding activities and depends on individuals at each level.

According to (Zaire & Simintiras 1991, in Lakhe and Mohanty 1994) 'TQM is a combination of total system process towards doing the right things (externally), everything right (internally) at the first time and all the time, with economic viability considered at each stage of each process'.

Hand (1992), defines TQM as "a strategic approach to producing the best products and services through a process of continuous improvement of every aspect of a company's operation". Moreover, he notes that "TQM is a radically new way of managing business, a way that challenges management's traditional role".

Develin & Hand (1993), state that "TQM is a system of behaviour which embraces every individual within an organisation: it seeks to include each person within a framework of shared beliefs and values and to instil a common aim and purpose. Its driving principle is continuous improvement".

Bricknell (1996), states that "One of the precepts of the TQM is that by concentrating on getting things right the first time, other benefits such as lower costs, greater efficiencies, improved market share, increased employee motivation and satisfaction, and better reputation will inevitably follow".

For Brah et al. (2002), TQM is a set of guiding principles and practices, as well as a philosophy, which address not only the management of quality but also the quality of management.

2.7.8 Summary of the Ideas of the Gurus

There are different opinions about TQM, and the reasons of these differences are discussed in a paper by Hellston and KlefsjÖ (2000). The first reason is the gurus, who are often seen as fathers of TQM, do not, in fact like the concept. For example, Deming never did use the term TQM, and said “the trouble with TQM, is that there is no such thing, it is a buzzword". Deming said that "the term TQM implies quality as a method but in reality it is the outcome of a method”. This resistance to the term TQM from some gurus could be what made people doubtful and reduced their willingness to implement this term. The second reason is that there are many similar concepts for roughly the same idea, such as total quality control, total quality improvement, and strategic quality management. The third reason is that there are many vague descriptions and few definitions of what TQM really is. The formulations are very clear in these definitions such as "a way to….” a “philosophy for…", “a culture of …", " approach for…".

Even here, in the above-mentioned views of the gurus, there are some differences in definitions or philosophy for TQM. Many characteristics of TQM can be distilled from the above definitions, namely that TQM:

- Is a management philosophy to guide a process of change;
- Ensures quality is recognised as a corporate strategic priority, along with financial and other priorities;
- Starts at the top
- Calls for planning;
- Requires organisation- wide improvement
- Calls for everyone to be skilled and knowledgeable;
- Promotes teamwork;
- Is about achieving result by process based approach;
- Focuses on customer;
- Recognises internal customer-supplier relationship;
- Considers suppliers as part of the organisation's processes;
- Seeks disciplined approach in continuous improvement efforts;
- Aims to instil a ' prevention not inspection" ethic

- Emphasises importance of measurement; and
- Reduces total cost of meeting customer requirements.

The term “quality” for Deming means "Continuous improvement" and the target is Zero defect. Juran argues that for quality to improve, short term "sporadic" or long term "chronic" problems must be resolved, and the cost of quality includes both conformance and non-conformance. Crosby, on the other hand, believes that the cost of quality includes only the non-conformance costs, and conformance costs of prevention and appraisal are not really the cost of quality, but more the cost of doing business. Table (2.4) shows a comparison of the experts:

Table 2.4: Comparison of the Experts

	Deming	Juran	Crosby
Definition of quality	Continuous improvement	Fitness for use	Conformance to requirements
Application	Manufacturing driven companies	Technology driven companies	People driven companies
Target audience	Worker	Management	Worker
Emphasis on	Tools/ system	Measurement	Motivational
Type of tools	SPC	Analytical, decision making and cost of quality	Minimal use
Use of goals and targets	Not used	Breakthrough projects	Posted goals for worker

Source: Kerzner, H, (2003), Project Management: A system approach to planning, scheduling & control, 8th edition.

In order to build a solid scholastic base to help probing for the answers of the research questions, there was a strong need to review all the pre-existing literature related to this research study. This review was also intended to support examining and eventually proving the researchers hypothesis. The foundational knowledge this review provided was also based on the data acquired through surveys of experienced senior, middle and junior level project managers from the industry and most importantly by the experts that are regarded as “gurus” in this field of quality management. Therefore, it was important

not only to carry out comprehensive literature review, but to provide a critical analysis of those who are directly relevant to this study.

It is broadly assumed, at least from one angle, that the capability to manage and control the output is called the management competence. The conventional concept of management's task in harnessing human energy to organizational requirements and if it is channelled to the quality requirements, then it makes the process easy to be implemented. Deming's philosophy and definition for the quality is plausible and is strongly agreed upon in this study, as he advocates that the "quality should be aimed at the needs of the customer, present and future". Deming's philosophy emphasis on meeting the customer requirements in present comparing to projects construction process. This mean that it is deployed from the design stages, to the point of finalisation of the project, when it is handed over to the clients either as a product or service. In Deming's' view, the foundation of quality management is reducing the variation in products and the improving the average, comparing to the constructions projects process and during the construction stages. There are a lot of variation and changes, - that lead to waste of materials and time. Therefore, focusing on the reducing of variations has a positive impact on the construction processes. Moreover, Deming incorporate the culture in work, which is one of the critical success factors in construction companies, since different cultures do exist and time can become a major barrier.

2.8 Tools and Techniques of TQM

Chan (2003) said ' You cannot manage what you cannot measure'. Consequently, there is a need to establish a process for measurement of quality management system performance, aiming at monitoring data on current and end user customer satisfaction for all essential processes. Therefore the organisation needs to establish a sufficient and workable process.

TQM tools are technical means used to work in the quality programs, and often include diagrams, statistical graphs, also, used to improve processes or develop products in any organisation by identifying, analysing and evaluating data that is relevant to their business. Therefore by using the tools and techniques, one can investigate problems,

identify solutions and implement them in work practices, by measuring and analysing the outcome.

The seven quality control tools described by Ishikawa (1976) are usually perceived as too simplistic and not appropriate (Lamb and Dale, 1994 in Bamford and Greatbanks, 2005). From the literature review on TQM tools and techniques, it was found that there are different classifications for TQM tools and techniques such as:

In a study conducted by Scheuermann L. et al. (1997), the tools classified as Qualitative tools include flow charts, cause-and-effect diagrams, multi-voting, affinity diagram, process action teams, brainstorming, election grids, and task list), whereas Quantitative tools include Shewaryt cycle (PDCA), Pareto charts, control chart, histogram, run chart, and sampling. In their study, they placed interesting questions and aimed at answering, whether or not the TQM programmes are more successful in organisations when their approach to TQM is based on the use of quantitative tools rather than solely on the use of qualitative tools. From their survey, they found that quantitative tools are used more by those organisations that are more successful.

According to McQuater et al. (1995), TQM tools are practical methods, skills, means or mechanisms that can be applied to particular tasks. They are used to facilitate positive change and improvement, and they distinguish between tools and techniques as follows: tools are described as a device that have a clear role, often narrow in focus and used on its own, such as cause and effect diagrams, Pareto analysis, control chart, histogram and flowchart. A technique has a wider application, often resulting in the need for more thought, skill and training to be used effectively, such as SPC, benchmarking, quality function deployment.

Bamford and Greatbanks (2005), suggest in their paper that the following are the key for the successful implementation, use and success of applying the QC and M7 tools and techniques:

- in depth knowledge of the process;
- formal training in problem solving techniques;

- appropriateness of tools selected for use; and
- Application simple models at all levels in the organisation to learning.

Dale (2003), states that all techniques have similar importance, but that they are different and applicable in different situations. This means that each technique has unique qualities and can present the same data in different ways. Dale also strongly maintains that an effective employment and a mix of tools and techniques constitute the way to solve problems.

All previous tools are only examples and there may be more. As mentioned by ReVelle (2003), the number of TQM tools is close to 100 and they come in different forms. In addition to this they may be described as instruments or methods used for the work in TQM programs. To give a clearer understanding of these tools, there follows a brief description of the basic or most popular sets of TQM tools:

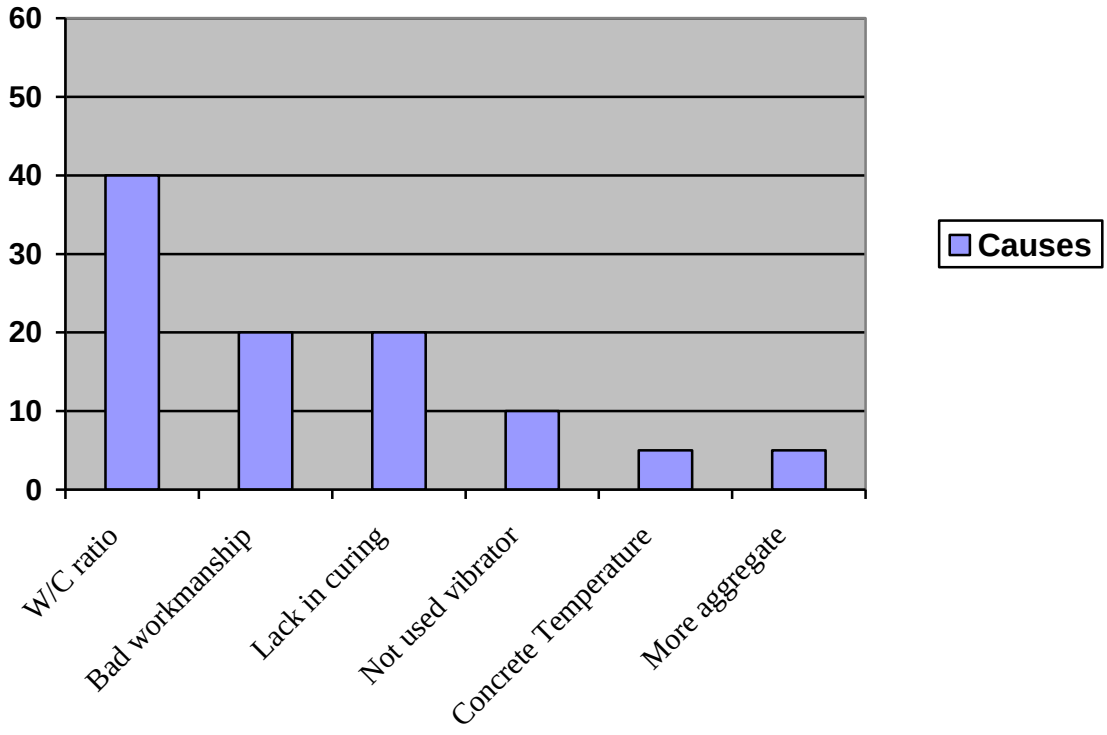
◊ **Pareto Principle: identification of the key problems**

The Pareto Principle aims at identifying the causes which contribute to the maximum problems and concentrates on these problems. It then implements a required modification or action to solve these problems. In another words the most effects come from few causes. The Pareto chart introduces the necessary facts to determine priorities, so it organises and presents data to indicate their relative importance. In statistical terms, 80% of the problems arise from the 20% of the reasons, although this percentage is not always accurate, but often finds that significant problems are few, and vice versa.

From this, one can conclude that the Pareto chart is very useful in some cases such as when analysing data, focusing on the most important problems or reasons, displaying data, and to assessing improvement. For example from the graph shows in Figure (2.5), that there are many causes for concrete cracks, such as water cement ratio, bad workmanship, lack in concrete curing, improper use of vibrator, high concrete temperature during casting, and extra aggregate used in the concrete mixture. It is also, very clear that the water cement ratio represents the major cause for concrete cracks. In

order to reduce the cracks occurring in concrete, one can focus the maximum efforts on the controlling the W/C ratio without neglecting the other causes.

Figure (2.5): Pareto Diagram

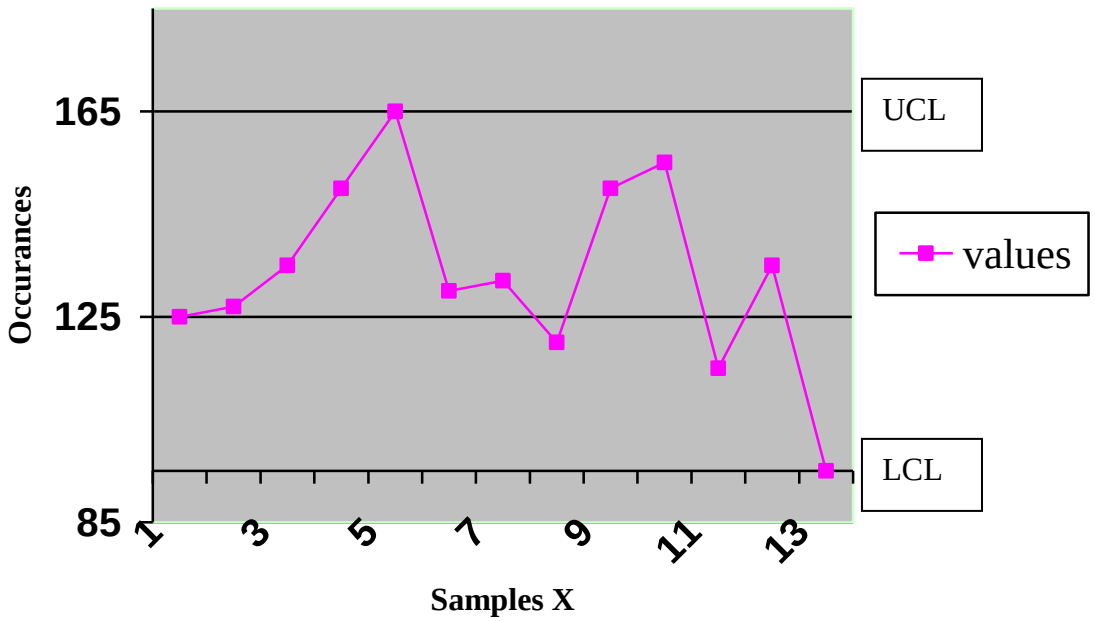


Source: The Researcher (2009)

◊ **Control Charts : Variation Control**

Control charts or Statistical Process Control measure (SPC) is a control system for production processes, mainly used to study how a process works. In a normal distribution, a control chart has a central line for the mean, the Upper Control Limit (UCL) and Lower Control Limit (LCL). These lines can be calculated from historical data. By comparing present data (LCL) with (UCL), so a process could be controlled by monitoring whether the actual measures go above (UCL) or below (LCL). If so then the process is (out of control). As shown in Figure (2.6).

Figure 2.6: Example for Control Chart



Sources: The Researcher

◊ **Scatter Plots: The Relationship between Factors.**

Scatter Plots or scatter diagram is effectively a line graph with no line, with one variable on each axis, to look for a relationship between them. This plot has a similar function to other plots or charts, but it is easier to see the relationship through something which is more than a simple table of figures, and this plot is used to clarify the relationship between the variables and can identify a causal link between them, but which cannot be proven. It is useful to use a scatter plot or diagram in some cases such as, finding out the relationship of cause and effect, and in a series of continuous data measurements, such as the relationship between the strength of concrete and time, because the strength of concrete increases over time.

◊ **Flow Charts:**

Flow charts clarify how the process is working in the form of a series of chains by showing all the steps of a process. It shows where the process starts and where it ends and where the next process will start. Flow charts are very useful in many quality activities; they can be used to describe the current and future situation, in addition to their use in

determining inputs and resources and the people who must participate in the process. They are also useful in identifying important areas for data collection and generating assumptions about potential causes of problems. It can therefore be said that the flow chart is a multifaceted tool which can be used in performance to improve program and resolve problems. There are several types of these charts such as: Simple charts, Detailed charts, and Procedural charts

◊ **Cause and Effects, Fishbone, Ishikawa Diagram :**

The cause and effects diagram which is also defined as a fishbone or Ishikawa diagram, is used to determine the root cause of the problem or such analysis, and is also used to organise and shorten a huge amount of data by presenting the relationships between events and potential or actual causes. This analysis generates and classifies ideas and hypotheses about the possible causes within the specific process. The diagram can help or facilitate exploration of further reasons. Even though, the cause and effects diagram will not show the real reasons that led to the emergence of the effect, it still lists all possible causes without knowing the contribution ratio of each cause. However, as a second step, a deeper study could be made for each case, as this tool cannot identify the root of the causes.

◊ **Histogram or Bar Graph :**

The development of the histogram is ascribed to A.M.Guerry. In 1833, he presented a new statistical chart for describing crime data. It is almost a summary statement of changes in the set of data and thus this chart enables us to see patterns that are difficult to see in a simple table of numbers. The distribution pattern has three important points: central, width, and shape of the curve. The histogram works as a quantities variables for example for time, weight or temperature, and is not suitable for descriptive data. However, it could be used to identify root causes and verification of achievement. Moreover, the aim of analysing a histogram is to classify the differences in data.

◊ **Check Lists :**

Check lists are specific models for the collection of data which require analysis, and they are also used to make sure that all the work steps are implemented.

As an extension to the previous tools, there are new tools used to improve the innovation processes. These tools are provided to managers and workers to satisfy process, and to allow individuals to contribute to the process. These tools do not replace statistical methods, but they are used together as part of continuous improvement. In another words, one can refer to these new or advanced tools as documentation methods. Oakland 2006, listed them as follows:

- Affinity diagram
- Interrelationship diagram
- Tree diagram
- Matrix diagram or quality table
- Matrix data analysis
- Process decision program chart (PDPC)
- Arrow diagram

◊ **Affinity Diagram**

This is used to gather large amount of language data (ideas, issues, opinions) and organises them into groupings based on the natural relationship between the items. It is a form of brainstorming. The output of this exercise is a compilation of a maximum number of ideas under a limited number of major headings.

Kawakita Jiro, developed the Affinity diagram or KJ method, which has become one of the most widely used of the Japanese management tools. Moreover, if facts need to be organised, Ishikawa recommends using the affinity diagram, so usually teams use this tool for the creation of ideas, opportunities of improvement, methods, alternative solutions, and resistance to change.

◊ **Interrelationship Diagram**

This tool is used to determine the relationship between cause and effect among critical issues. Even when objective data is unavailable, this tool can be used to distinguish between issues of drivers and outcomes.

◊ **Tree Diagram**

The tree diagram, which is known as system flow, is an organiser tool used to link different issues, ideas, and goals, which help in detailing extensive or general information. In other words, this tool is used to identify all the factors contributing to a problem under consideration.

◊ **Matrix Diagram**

The Matrix diagram is an important tool, and the purpose of this diagram is to determine the relationship between pairs of factors and tasks, and assist in organising according to priorities.

◊ **Matrix Data Analysis**

Matrix data analysis arranges data displayed in a matrix diagram to become more easily viewed and shows the strength of the relationship between variables, and it is very useful in marketing and product research. The concept behind matrix data analysis is fairly simple but its execution can be complex.

◊ **Process Decision Programme Chart**

A process decision program chart (PDPC) is used to map out each event and contingency that can occur when progressing from a problem statement to its solution. The PDPC is used to anticipate the unexpected and plan for it. It includes plans for counter- measures on deviations. The PDPC is related to a failure mode and effect analysis and its structure is similar to that of tree diagram.

◊ **Arrow Diagram**

The arrow diagram is used to plan or schedule a task. To use it, one must know the sub-task sequence and duration. This tool is essentially the same as the standard Gantt chart. Although it is a simple and well-known tool for planning work, it is surprising how often it is ignored. The arrow diagram is useful in analyzing a repetitive job in order to make it more efficient.

It is clear the above discussions are related to the total quality management (TQM) tools and techniques. A variety of tools and techniques of total quality management might be used to monitor the processes and discover the defects in earlier stages, then rectify the problems. Since most of the TQM tools and techniques are overlapping and integrated, it is necessary to understand and select which tools and techniques are suitable to solve the problems. Table (2.5) Summarized the most tools and techniques commonly used in construction industry:

	Pareto Principles	Control Chart	Cause and Effects Diagram	Affinity Diagram
Aims	Identification of the Key Problems	Creation Control	Determine Root Causes	Create New Ideas
How	Analysis Data	Monitoring	Shorten the Data	Grouping the Data
Widely used in construction industry	4	2	1	3

Table (2.5): Comparison of TQM Tools and Techniques

2.9 TQM Models and Frameworks

2.9.1 Models Proposed by Experts

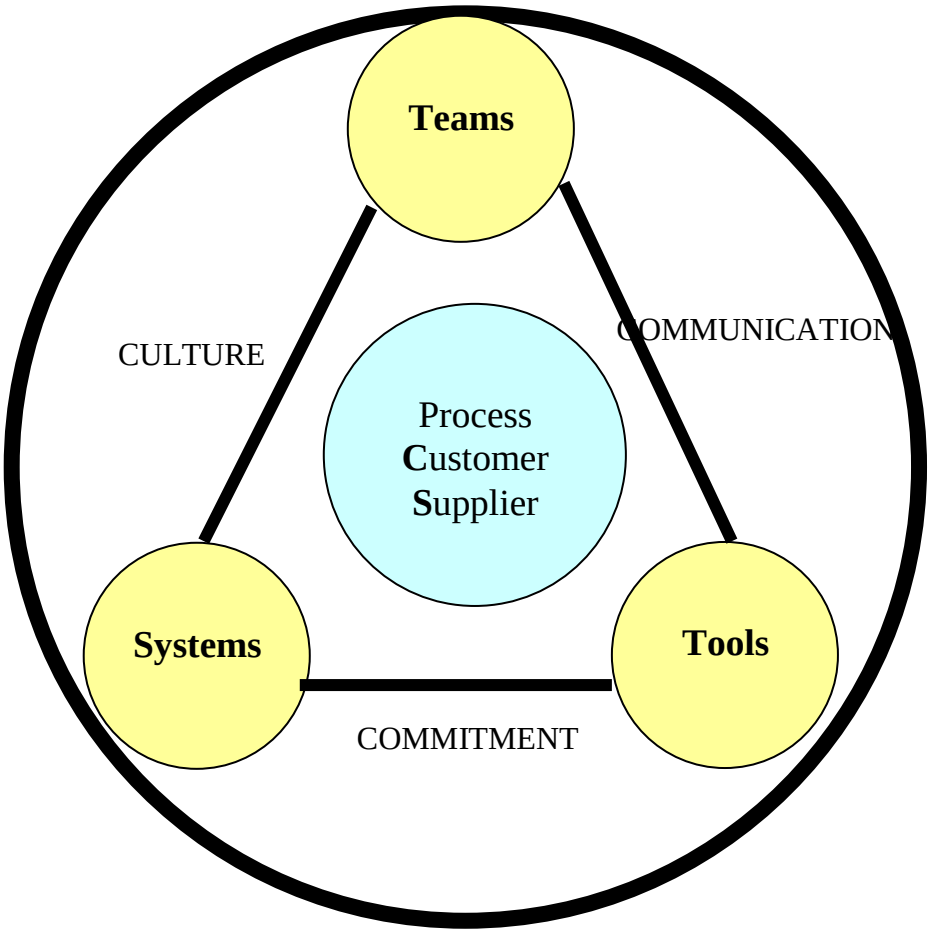
The various models presented by experts are most advantageous for organisations when they select which models will fit with their implementation process. It is therefore very interesting to look at important TQM models from an integration point of view.

Voehl (1995) presented the main principles of TQM in the form of the "House of Quality", the roof consisting of three sub systems: the management, the social and the technical sides of the organisation, and this represents the superstructure of TQM. To quality supports the following superstructure, which has four pillars: customer satisfaction, continuous improvement, managing with facts and respect for people. The foundation of TQM, according to Voehl (1995) is made up of four managerial levels, which are strategy, process, project, and task management. Finally, the cornerstones for the quality house are the strategic, operations, project and personal quality planning.

The model proposed by Oakland (2006) as shown in Figure (2.7), was widely embraced and adopted in the UK through the activities of the Department of Trade and Industry (DTI) 'Quality Campaign' and 'Managing in to the 90's programmes. These approaches brought together a number of components of the quality approach, including quality circles (teams), problem solving and statistical process control (tools) and quality systems, such as BS 5750 and later ISO 9000 (system).

Culture played a large role in the environment of those organisations that were successful in implementing the TQM approach. Communication is always seen to be essential in achieving success but the most important element is commitment, from everyone in the organisation, especially from those who are in direct interaction with customers. The customer / supplier or 'quality chains' form the core, which is surrounded by the hard management necessities of a good quality system, tools, and teamwork. This model was found to be very useful, especially from the public sector as a first step to the TQM approach.

Figure (2.7): TQM MODEL



Source: Oakland, J, Marosszeky, M, (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

2.9.2 Models Based on Quality Awards

The Deming Prize in Japan in 1950 was the start of these quality awards, so the companies began to become interested in quality frameworks. Evan and Lindsay (2001), show that the quality awards instituted by several countries help promote awareness of quality and productivity and facilitate exchange of information among organisations, as well as encourage organisations to adopt strategies to improve quality, productivity and competitiveness.

2.9.2.1 Malcolm Baldrige National Quality Award (MBNQA)

As a part of quality improvement efforts, companies should measure their progress. The measurement can be by customer or employee survey and this could help to monitor process improvement, but criteria to evaluate the effectiveness of overall quality process are necessary.

The aim of the award was to promote quality awareness and its impact on competitiveness, share information on successful quality strategies and the benefits derived from implementing these strategies, and proposes a set of criteria that can be used by business, industry, government and other enterprises in evaluating their own quality improvement efforts. Moreover, Baldrige's criteria are grouped into four basic elements: driver, system, measures of progress, results and goal.

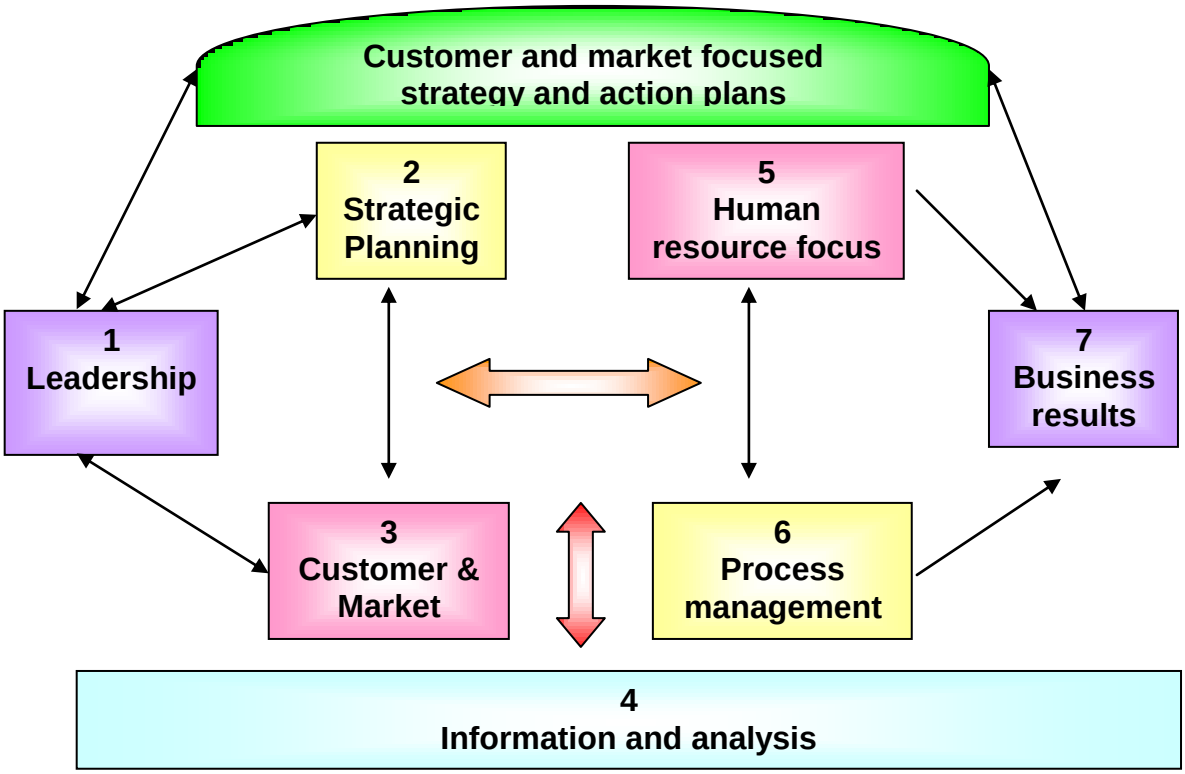
Companies are awarded the Baldrige National Quality Program for Performance Excellence, when they successfully implement the Baldrige model. This model helps organisations to improve their capabilities, performance practices, and results. Communication is facilitated by sharing the information on best practices around in the industry. This serves as a tool for guiding, understanding and managing performance and for planning opportunities for learning. The Baldrige Award criteria are built on the following set of interrelated core values and concepts (NIST, 2003):

- Visionary leadership
- Customer-driven excellence
- Organisational and personal learning
- Valuing employees and partners
- Agility
- Focus on the future
- Managing for innovation
- Management by fact
- Social responsibility
- Focus on result and creating value
- Systems perspective.

These are embodied in seven categories which are used to assess organisations:

- The leadership category: this examines how the senior executives create a clear quality value system to guide all company activities.
- The strategic planning category: this examines how the company sets strategic directions, how it determines key action plans, and then to translates them into an effective performance management system.
- The customer and market focus category: this examines how the company determines requirements and expectations of customers and markets. Also determine their satisfaction.
- The information and analysis category: this examines the management and effectiveness of the use of data to support key company processes and performance management systems.
- The human resource development and management category: this examines how the workforce is enabled to develop and utilize its full potential with the company's objectives.
- The process management category: this examines the key aspects of process management, including customer-focused design, product, and service delivery processes, support processes, and supplier and partnering processes involving all work units.
- The business results category: this examines the company's performance and improvement in key business areas including customer satisfaction, financial and marketplace, performance, human resources, supplier and partner performance, and operational performance.

Figure (2.8): Baldrige Model



Source: Oakland, J, Marosszeky, (2006), M, Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

The framework's system connects and integrates the categories, as shown in Figure (2.8). The three basic elements are organisation profile: at the top of the figure is shown the context for the way the organisation operates, or its system operations: the centre of the figure defines operations and the results which can be achieved, and information and analysis: these serve as a foundation for the performance management system. The senior executive leadership plays the most important role and is the main driver, creating values, goals and systems, and guiding the sustained quest of quality and performance objectives. The system enables management to have a set of well- defined and well designed processes for meeting the organisations direction and performance requirements.

Moreover, the Baldrige Award led to true interest in quality award frameworks that could be used to carry out self-assessment and to build an organisation-wide approach to quality, which was truly integrated into business strategy. Srivivatanakul and Kleiner (1996), in their paper about developing a plan to win the Baldrige Award, conclude that, to becoming a world- class organisation, well defined plans are essential, and to win the

Malcolm Baldrige National Quality Award, ensuring the proper implementation of the company's procedures is even more crucial.

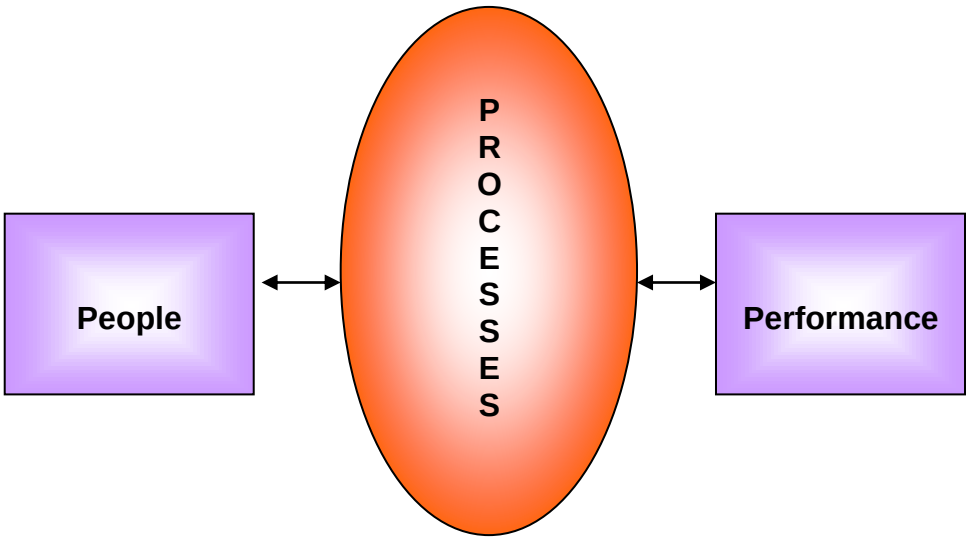
2.9.2.2 European Quality Award

In the 1990s, the European Foundation for Quality Management (EFQM) launched the European Quality Award, which is the most prestigious award for organisational excellence and is the top level of the (EFQM) levels of excellence. The award includes a separate category for organisations in the public sector, and for factories, sales and research units. This framework was the first one to include 'Business Results' and really to present the whole business model. According to Iaquinto (1999), the model consists of nine elements: five enablers such as policies and processes that drive the business and facilitate the transformation of inputs to output and outcomes, and four measures of results such as measures the level of output and outcomes attained by the organisation.

Similar to the Baldrige award in the US, the European Quality Award in Europe is designed to increase the awareness throughout the European Community, in business in particular, of the growing importance of quality to their competitiveness in the increasingly global market and to their standard of living (Evans and Lindsay, 2001).

Moreover, the EFQM Model emphasises that it is to be recognised that process is the approach by which an organisation harnesses and releases the talents of its people to produce the desired performance. In addition to this, improvement in performance can be achieved by improving processes and this can be brought about by involving the people. The simple model is that people improve performance by means of good processes is shown in Figure (2.9).

Figure 2.9: The Simple Model to Improve Performance

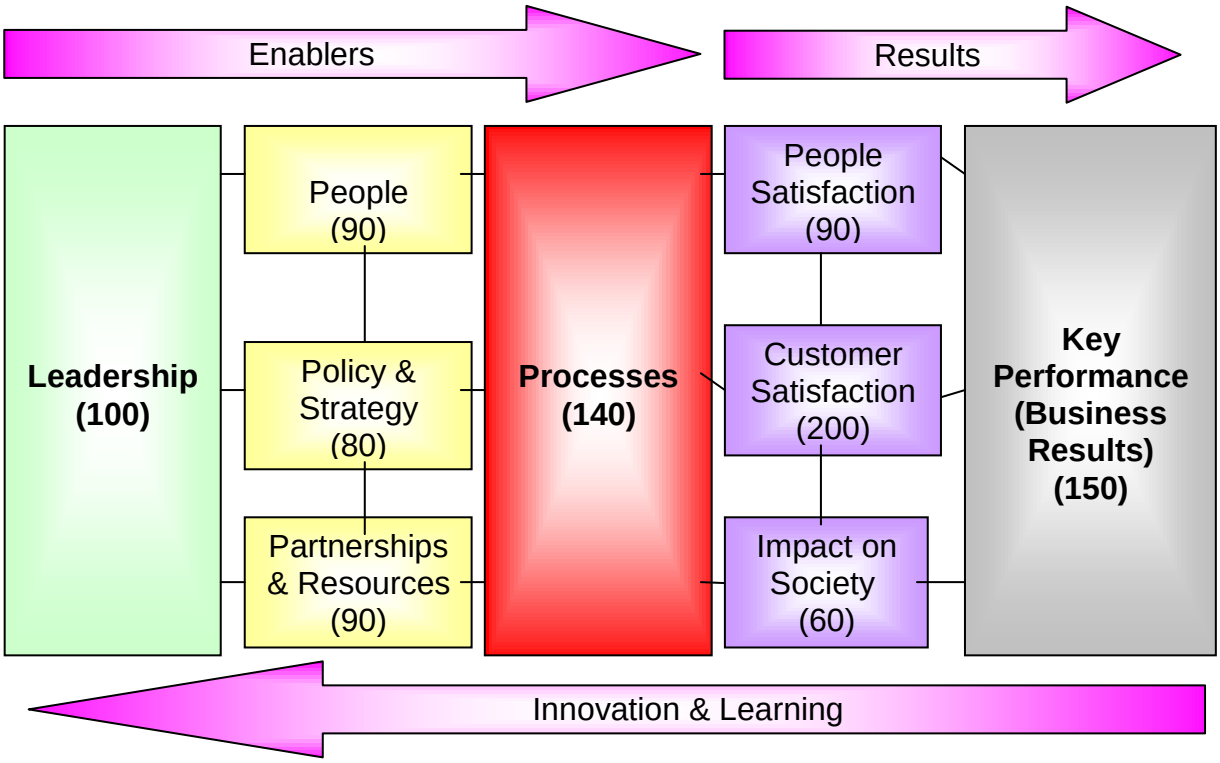


Achieve better performance through involvement of all employees (people) in continuous improvement of their processes

Source: Oakland, J, Marosszeky, M., (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

Figure (2.10), represents the non-prescriptive framework of the full excellence model. In that framework, based on nine criteria, almost 50% are 'Enablers', which cover what an organisation does, and 50% are 'Results', which cover what an organisation achieves or, in other words, Results are caused by Enablers. Leadership driven policy and strategy are necessary to aid customer, employee and favourable society results, and besides these people partnerships, resources and processes are directed towards ultimate excellence in key performance results. The delivery of these results enables the drive towards innovation and learning.

Figure 2.10: The EFQM Excellence Model



Source: Oakland, J, Marosszeky, M., (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

The EFQM publication for the new millennium of the so-called 'Excellence Model' captures much of the learning and provides a framework which organisation can use by following these ten steps:

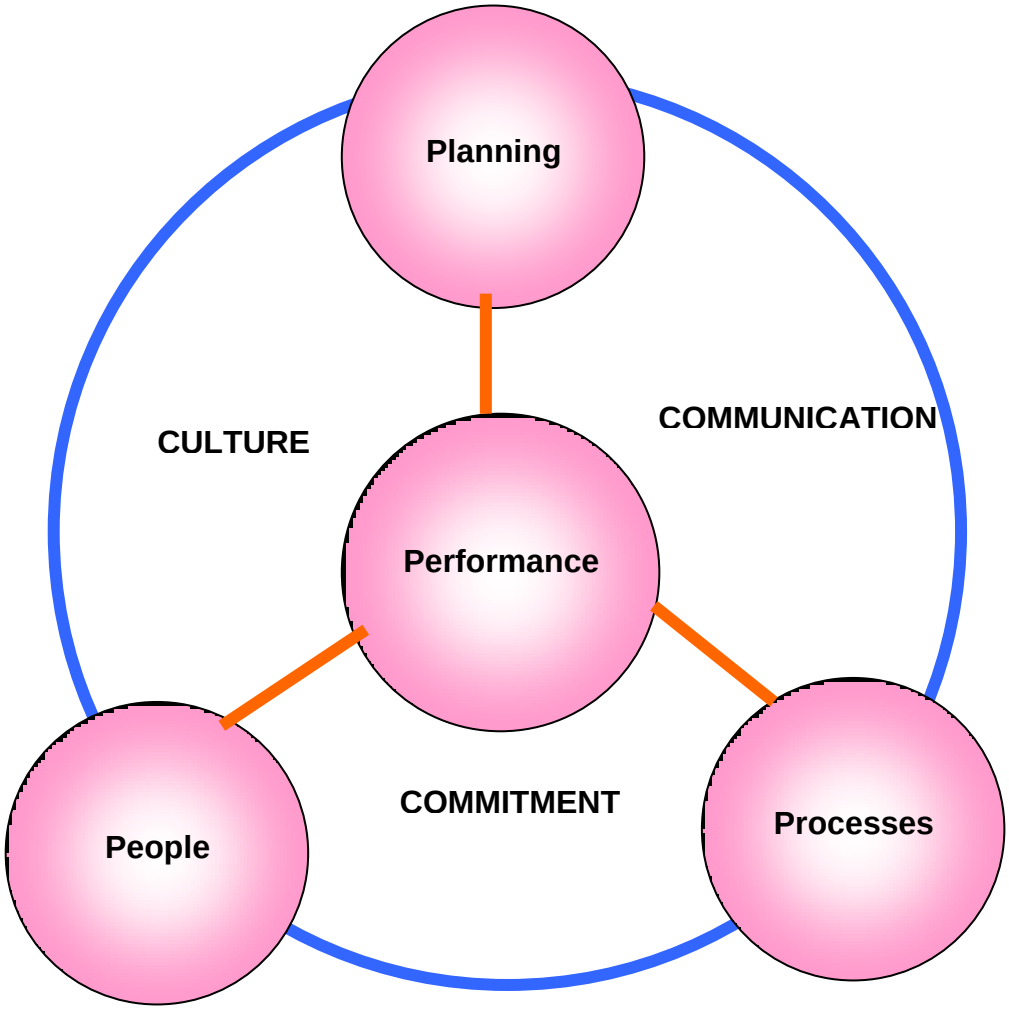
- ◊ Set direction through leadership
- ◊ Establish the results they want to achieve
- ◊ Establish and drive policy and strategy
- ◊ Set up and manage appropriately their approach to processes, people, partnerships and resources
- ◊ Deploy the approaches to ensure achievement of the policies, strategies and thereby the results
- ◊ Assess the 'business' performance, in terms of customers, their own people and society results
- ◊ Assess the achievements of key performance results
- ◊ Review performance for strengths and areas for improvement
- ◊ Innovate to deliver performance improvements
- ◊ Learn more about the effects of the enablers on the result.

MaCarthy (2005), in study about the impact of EFQM Excellence model on leadership in German and UK organisations found there were more differences in perceptions of good practice between German organisations recognised for excellence and German organisations not using the Excellence Model than between German and UK organisations. In the UK, there were more differences between what was described as good practice and what was described as usual practice among organisations not using the Excellence Model than among organisations recognised for excellence. German assessors differed in their view of good practices from UK assessors and German organisations.

2.9.2.3 The New Model for TQM

The new TQM model provides the basis of excellence in the industry and covers all angles and aspects of an organisation and its operations. It is based on the excellent work done during the last century. Oakland (2006), presents a new model for TQM that addresses the hard and soft issues of quality. As shown in Figure (2.11) performance improved through better planning, and the management of people and the processes in which they work. These are the keys to delivering quality products and services to customers. These four Ps are important in to delivering quality products and service to customers. The early frameworks of TQM involved three Cs, culture, communication and commitment, which we can never underestimate as they are the foundation of the TQM framework. Oakland adds these are the "soft foundations" which must encase the hard necessities of planning, people and processes.

Figure 2.11: New Framework for Total Quality Management



Source: Oakland, J, Marosszeky, M., (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

The choice of a quality model or quality system is a critical issue because it depends on the vision of the organisation. There are many models, and each model can provide an idea to any organisation, but there is no model that can furnish all the solutions for all organisational requirements. Therefore, quality models or quality systems provide a concrete foundation to communicate as to how an organisation should work and identify the responsibilities of all members participating in the organisation. Table (2.6) present the different quality models.

Table (2.6): Comparison of Different Quality Models

Models	**Criteria**	**Focuses**	**Most important elements have an impact on construction industry**
TQMEF (TQM-Efficiency) Model	Process & Efficiency, Customer Focused Performance, People Management, Team Building & Business partner Development	Process & Efficiency	Processes, Customer, people management
Oakland Model	(3C) Culture, Communication, Commitment + (4P) Planning, Performance, Processes + People	Commitment	Commitment, Culture, people, processes
MBNQA (Malcolm Baldrige National Quality Award	Leadership, Strategic Planning, Customer & Market, Information and analysis, Human Resource Focus, Process management, Business Results	Leadership	Leadership, Human Resources, processes
EFQM (European Foundation Quality Management)	Leadership, People, Policy & Strategy + Partnership & Resources + Processes + People Satisfaction+ Customer Satisfaction + Impact on Society + Key Performance	Leadership	Leadership, People, Customers, Processes, Society

The EFQM Model selected as a data collection frameworks and a guideline for proposed framework for the following reasons:

- The EFQM model consist almost all TQM principles comparing to other models.
- The EFQM model focuses more on the impact on society, compared with the construction industry. It is evident that the construction industry has a great impact on the community and socialites face severities owing to poor construction.

2.10 TQM and Six Sigma

2.10.1 Six Sigma Concept

The Six Sigma is a methodology that blends together many of the key elements of past quality initiatives while adding its own special approach to business management, and the main goal of Six Sigma is to reach 3.4 defects per million opportunities over the long term. The Six Sigma methodology focuses on customer knowledge by translating customer needs and expectations into areas for improvement.

The Six Sigma is a statistical concept that measures a process in terms of defects. Achieving Six Sigma means the processes are nearly perfect. In its business use, it indicates defects in the outputs of process, and helps organisation understand how far the process deviates from perfection. Six Sigma has been considered as a philosophy that employs a well-structured continuous improvement methodology to reduce process variability and drive out waste within the business processes using statistical tools and techniques (Antony and Bañuelas, 2002).

The term Six Sigma is more related to eliminating the defects, and if the organisations understand the concept very well, so these will lead to detects defects and hence increase their profits. In a study carried out Banuelas, Antony (2004), one of their conclusions was that the Six Sigma has been embraced in many companies as the new business strategy. It is focused on improving processes by eliminating variation using a well-structured methodology.

2.10.2 TQM vs. Six Sigma

In a study conducted by Antony (2007), it is discussed whether Six Sigma is a management fad or a fact. Antony's conclusion found that Six Sigma will be around as long as it continues to yield measurable bottom-line results in organisations. Although the number of applications of Six Sigma in manufacturing companies has gone down a great deal, Six Sigma in other areas such as finance, healthcare, IT and banking has gone up significantly in recent years.

The Six Sigma methodology consists of five phases, which are known as (DMAIC):

- **D**efine the projects, the goals, and the deliverables to customers (internal and external)
- **M**easure the current performance of the process
- **A**nalyse and determine the root causes of the defects.
- **I**mprove the process to eliminate defects.
- **C**ontrol the performance of the process.

There is logic behind the five phases, as Six Sigma involves a number of statistics and equations, but it is not a statistical program; rather it shows how to use statistics and how to understand their value, in order to make rational and measurable decisions about business processes. Many organisations worldwide (manufacturing companies, service-oriented companies, small and medium-sized enterprises (SMEs) have implemented Six Sigma and achieved remarkable improvements in their market share, customer satisfaction, product reliability and service quality with impressive financial savings (Harry and Schroeder, 2000). On the other hand, some researchers have opposed the Six Sigma; Gardner (2002) opposes the Six Sigma's define-measure-analyze- improve–control incremental approach to the radical approach of reengineering.

The major difference between Six Sigma and Total Quality Management (TQM) is that Six Sigma incorporates control phase with ongoing checks in order to ensure that once improvements are achieved, they are not a one time or temporary phenomenon, but maintained over time. According to Scarnati and Scarnati (2002), Six Sigma is an industry standard for defect free products. The Six Sigma can be used to improve an existing process to create a new product or process. The differences between TQM and Six Sigma are summarised by (Pyzdek, 2001 in Pradeep and Sanchari, 2007) in Table (2.7):

Table 2.7: The Differences between TQM and Six Sigma

TQM	Six Sigma
A functional specialty within the organisation	An infrastructure of dedicated change agents. Focuses on cross functional value delivery streams rather than functional division of labour
Focuses on quality	Focuses on strategic goals and applies them to cost, schedule and other key business metrics
Motivated by quality idealism	Driven by tangible benefit far a major stockholder group (customers, shareholders, and employees)
Loosely monitors progress toward goals	Ensures that the investment produces the expected return.
People are engaged in routine duties (Planning, improvement, and control)	"Slack" resources are created to change key business processes and them organisation itself
Emphasizes problem solving	Emphasizes breakthrough rates of improvement
Focuses on standard performance, e.g. ISO 9000	Focuses on world-class performance, e.g. 3.4 PPM error rate.
Quality is a permanent, full-time job. Career path is in the quality profession	Six Sigma job is temporary. Six Sigma is a stepping-stone; career path leads elsewhere
Provides a vast set of tools and techniques with no clear framework for using them effectively	Provides a selected subset of tools and techniques and a clearly defined framework for using them to achieve results (DMAIC).
Goals are developed by quality department based on quality criteria and the assumption that what is good for quality is good for the organisation	Goals flow down from customers and senior leadership's strategic objectives. Goals and metrics are reviewed at the enterprise level to assure that local sub-optimization does not occur
Developed by technical personnel	Developed by CEOs
Focuses on long-term results. Expected payoff is not well-defined	Six Sigma looks for a mix of short-term and long-term results, as dictated by business demands

2.11 TQM and ISO 9000

The concepts of TQM and the ISO 9000 are almost new to most developing countries such as Qatar even though the ISO 9000 series of standards has become an internationally recognized means of managing organisations. Some industries in developing countries realised the benefits when some of the organisations in those countries were awarded the ISO certificate. Research conducted in Scotland (Witcher, 1993) found that the main reason enforcing and encouraging organisations to implement ISO 9000 was external pressure from customers.

According to the International Organisation for Standardization (ISO), there has been more than 16 per cent worldwide growth of certificates issued in an one-year period to December 2006, bringing the total number of certificates issued to 897866 (International Organisation for Standardization, 2006) in 170 countries and economies.

Sun (1999) presents the result of a study which aims to review was the pattern of implementing TQM versus ISO 9000 at the beginning of the 1990s. It found that the implementation of ISO 9000 is not always in parallel with the implementation of TQM. In fact, countries follow different patterns of quality improvement in terms of TQM versus ISO 9000. On the other hand, the quality management system proposed by ISO 9000 is a necessary foundation for other quality methods under TQM (Taylor, 1995 in Sun H., 1999).

ISO 9000 is made of four parts; ISO 9001 is applicable in contractual situations whereby the supplier is capable of demonstrating its ability in development, production, and servicing. ISO 9002 is applicable for contractual usage, and product conformance can be achieved through production and installation. ISO 9003 is applicable for quality assurance in final inspections and tests with the aim of detecting and controlling the disposition of any product nonconformity. ISO 9004 is serves as a guideline in developing and implementing a quality management system.

The main differences between ISO 9000 and TQM are summarised by Sui Pheng- Low (1998) in Table (2.8) ISO 9000 is primarily a quality management system in which the emphasis is on the writing of formal procedures and instructions to guide employees.

However, construction companies are more technical systems; they are social systems, so TQM is about integrating these two systems through the adoption of managerial processes which focus on customer needs, employee needs and stakeholders' needs.

Table 2.8: The Main Differences between ISO 9000 and TQM

ISO 9000	TQM
Focus on the customer is something secondary	Focus on the customer is essential
Not integrated with corporate strategy	Integral to company strategy
Employee involvement not necessary	Employee involvement and empowerment is important.
Can be departmentally focused	Organisation wide- all departments, functions and levels
Quality department responsible for quality	All employee are responsible for quality
Not necessarily continuous improvement	Definitely continuous improvement
Technical systems and procedures focused	Philosophy, concepts, tools and techniques focused

Srdoc, et al. (2005), stated that the ISO 9001 is a model for quality assurance in design, development, production, installation and servicing. Different from the old standard (ISO 9001:1994) that was focused on procedures, the new ISO 9001 (ISO 9001:2000) is focused on processes. Its eight key management principles are:

1. Customer based organisation.
2. Leadership.
3. Involvement of people.
4. Process approach.
5. System approach to management.
6. Continual improvement.
7. Factual approach to decision making.
8. Mutually beneficial supplier relationship.

2.12 TQM and Quality Assurance

Oakland & Marosszeky, (2006) defined Quality Assurance as "broadly the prevention of quality problems through planned and systematic activities (including quality documentation). These will include the establishment of a good quality management system and the assessment of its adequacy, the audit of the operation of the system, and the review of the system itself". The process of Quality Assurance then is an activity designed to provide evidence to confirm and consolidate confidence among all parties, and quality process is effectively implemented. The main interesting points in this stage are the quality in the disappearance of defect ratio (zero defects), and the study of quality cost as an economic decision to determine the quality level. Quality Assurance has adopted three types of quality control:

- Prevention control: this means following up the work implementation step by step to discover the defects before they happen, and prevent their occurrence.
- Progress control: this means inspecting the product after the end of each manufacturing stage, to ensure the quality level, so as not to allow for the product to move into another stage before inspection. This helps to detect defects when they occur and immediate actions apply.
- After production control: this means to ensure the quality of the product after the completion of the manufacturing and before it reaches the end user.

Nukulchai (2003), in his paper on TQM in higher education summarised some of the differences between quality assurance and TQM in Table (2.9) as follows:

Table (2.9): The Differences between Quality Assurance and Total Quality Management

Quality Assurance	Total Quality
QA is only a part of TQM. It is a systematic approach which gives adequate confidence and satisfies given requirements	TQM is a process to give continuous improvement in the performance of all activities, which provides satisfaction for customers, both internal and external and includes principles, tools and techniques.
Part of quality improvement process.	A process for continuous improvement.
A systematic approach influences attitudes and working environment.	Changes attitudes and working environment and provides tools, techniques and systems for continuous improvement.
Aims to ensure that customers' requirements are met every time	Creates a " right first time" attitude to delight customers
Improvement is by eliminating recurring problems	Improvement is by cultural change, based on the measurement of performance and elimination of root causes and constraints.
Requires a structures organisation and a statement of key responsibilities	Creates a culture in the organisation that seeks improvement in all its activities continuously.
Directive and provides procedures for all activities and working procedures.	Focuses on a full understanding of the various business processes by the day- to day involvement of all concerned.
Provides quality records of all activities.	Uses quality records for measurement and for continuous improvement.
The system relies on regular monitoring and audits to identify and correct non-conformances and improve procedures	Involves gathering ides and suggestion for improvements from everyone.
Regular management reviews of the procedures and working practices leads to improvement	Stresses the importance that products and services delivered to the customer (whether internal or external) meet the requirements, whether specified or not
Ensures that people are trained and experienced.	Ensures that everyone in the organisation receives education and training to enable them to do their job effectively and achieve personal satisfaction.

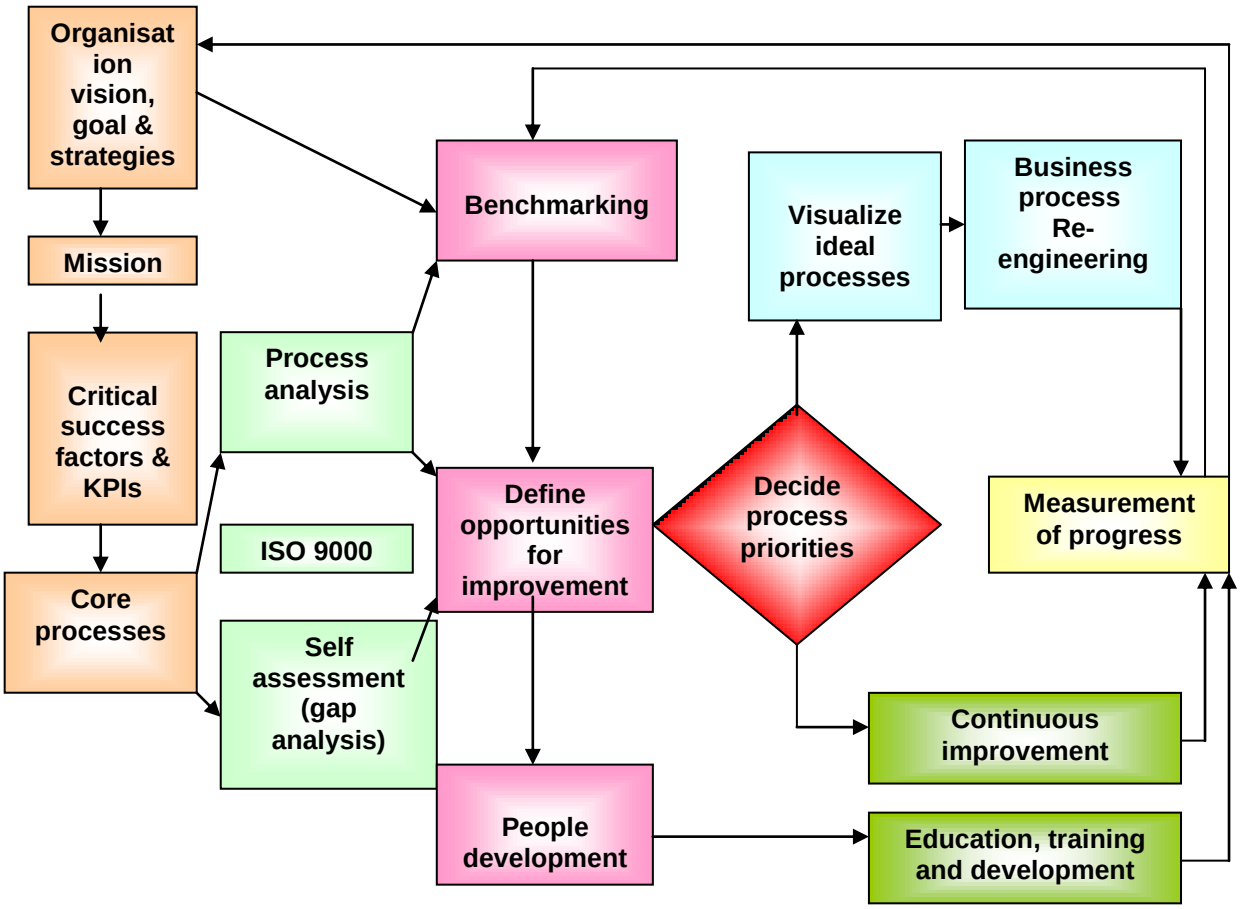
2.13 Total Quality Management (TQM) Implementation in Qatar

The implementation of TQM in the construction industry is far more needed today than ever before. According to Abdulaziz (2002) in his study about the realities of applying TQM in the construction industry observed that the major Japanese contractors in Japan have led the way in implementation TQM domestically, thus setting the benchmark for others to follow. TQM has been used successfully in several large organisations to effect change; the focus of senior management is not on formal structures and systems, but on setting up process management teams to solve organisation problems. The key to success is the alignment and involvement of all employees with the business of the organisation and its processes. When the focus of organisation is towards key processes, then the change process can be intense rather than on the actual issues such as culture and participation**.**

Most of the construction companies in Qatar are small to medium size companies and the implementation of the TQM philosophy could be easer than large companies. Also, it might be the first step towards improvement the practices of the parties who involved in the construction companies and in turn improve the construction companies' situation. Management leadership, a continuous improvement system, education and training, supplier quality management, systems and processes, measurement and feedback, human resources management, improvement tools and techniques, resources and work environment, and culture are the critical factors for successful TQM implementation in SMEs, as Yusof and Aspinwall (2000) show.

The process opportunities in planning should always be prioritised into continuous improvement. Measurement of performance of all processes and the activities that involve people development is necessary to determine progress, which aids in examining vision, goals, mission and critical success factors and, if it is necessary to meet the requirements for the organisation and its customers, it may be re-enacted. The rethinking process and planning for TQM enables us to create the new framework for the implementation of TQM. As shown in Figure (2.12).

Figure 2.12: The Framework for Implementation OF TQM



Source: Oakland, J, Marosszeky, M, (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

Based on the literature review, the implementation of TQM in Qatar, which is recognised and classified as a leading liquefied natural gas exporter world wide, is still weak. In (2000), the study conducted by Al-Khalifa and Aspinwall, found that the awareness and understanding of the TQM concept was at a very low level and the TQM critical success factors were not well-known and practiced. In addition to this, they found there is a large gap between the number of respondents who are aware of TQM and those who correctly understand what it is. They therefore conclude that it is essential to study TQM application and transferability for the benefits of the economy in Qatar, where the need is even greater owing to a lack of TQM information and understanding in the country.

Although there is a huge number of publications and considerable research related to TQM in developed countries, little work has still been carried out in developing countries

in general, and particularly in Qatar. Zairi (1996), shown that the region, comprising Middle Eastern countries in general is a long way from maturity in terms of the total quality practices and organisational culture and climate that are needed to implement TQM. Misunderstanding and lack of awareness towards the TQM concept in construction companies in Qatar could be leads to reject the idea and building the obstacles for failure the adoption this philosophy.

Most organisations in Qatar are believed to be interested in ISO certification much more than anything else, and look for this certificate as a boarding pass to international trade rather than look to a quality concept. This finding emphasises the work done by Zairi (1996), who reported that many Middle Eastern countries put more emphasis on ISO certification than on quality management improvement.

2.14 The Stages of the Implementation TQM Program

In the modern world the implementation of the TQM process is one of the most complex activities that a company can undertake, because it requires cultural change for everybody. (Kanji and Asher, 1993 in Dahlgaard, Kristensen and Kanji, 2002) developed a four-stage implementation process for their TQM model. In the critical analysis stage they indicated that output will be the continuous improvement cycle, i.e. PDCA cycle. The stages are:

1- Identify and preparation
2- Management understanding and commitment
3- Scheme for improvement
4- Critical analysis

at the critical analysis stage the output is Deming's cycle, i.e. plan-Do-Check- Act. However, the above four stages of implementation can be modelled according to the Deming's PDCA cycle as follows:

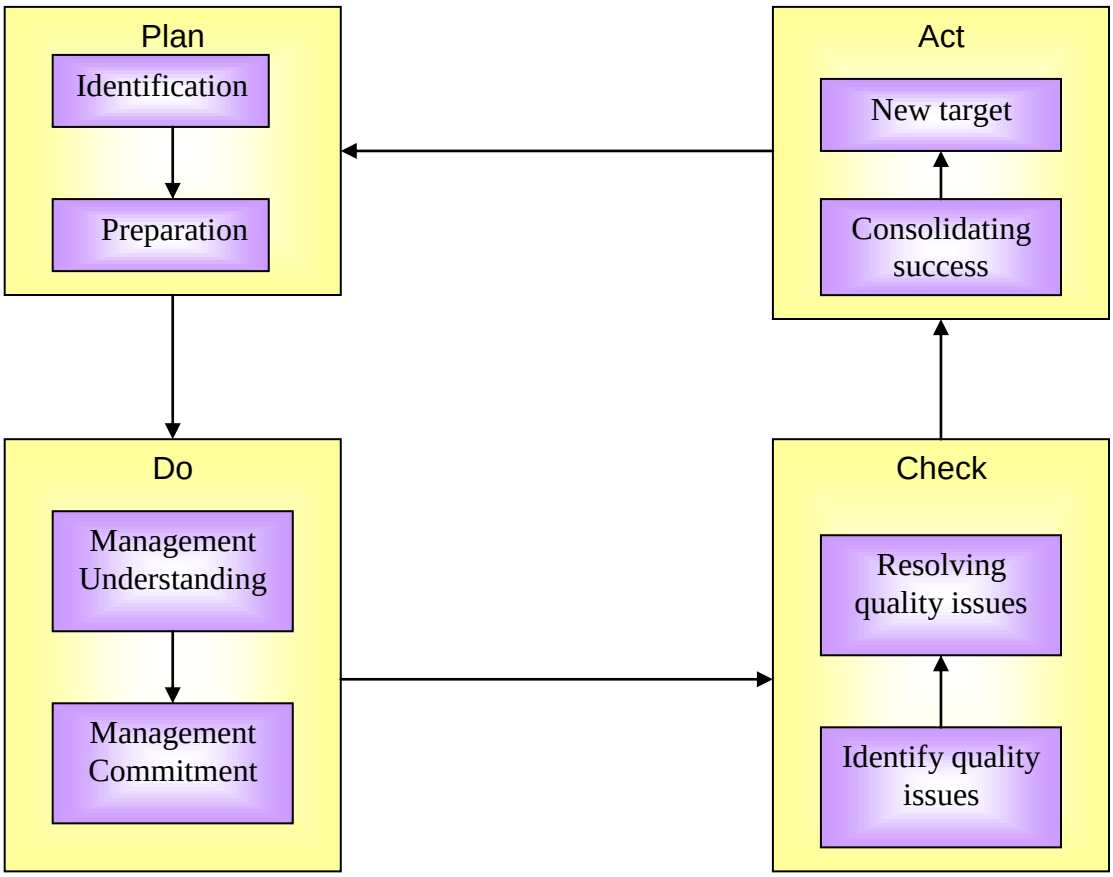


Figure (2.13): PCDA model for implementation

Source: Fundamentals of Total Quality Management, Jens J. Dahlgaard, Kai Kristensen and Gopal K. Kanji, 2002, published by Taylor & Francis

Kanji & Asher, (1993) described the four stages as follow:

- Plan: identifying and collecting information about the organisation in the prime areas where improvement will have most impact on the organisation's performance.
- Do: Making sure that the management understands the objective and methodology of TQM and are prepared to adopt them all the time.
- Check: By a process of involvement of management and supervision in a proper scheme of training and communication, identifying quality issues and affecting a resolution of them by management led improvement activities.

- Act: starting a new initiative with new targets and taking the complete improvement process to everybody indicating supplier and customer links in the quality chain. Obtaining information about progress and consolidating success.

It was clear from the above that to achieve successful implementation of total quality program, it requires to establish an adequate plan and management commitment is essential to apply the proposed plan. Sufficient management training and communication help to identifying the critical quality issues. Everyone in the organisation must link in the quality chain. The improvement in its operations and evaluations the outputs, will led to meet the needs of internal and external customers through comprehensive continuous improvement activities for the organisations as an integrated quality system.

2.15 Summary

This chapter started with the definition of quality and by reviewing the historically development of TQM concept. This was started with operator quality control before 1900, then foreman quality control in 1900- 1918, followed by the inspection Quality Control at the beginning of World War I, then Statistical Quality Control in 1936-1960. After the 1960's came the years of development of Total Quality Control (TQC) and finally, in 1980, TQM began its clear impact on business. One can therefore say TQM is an extension of quality management strategy, but TQM has more depth and comprehensiveness than quality management strategy. Moreover, it is clear that all quality controls are integrated together in order to produce a product or provide a service without defects.

The concept of TQM which has been identified by quality gurus and expertise has also been reviewed, most notably Deming’s philosophy and contribution through his 14 points as the principles of TQM, and the help to organisations to overcome the "seven deadly diseases" which represented as obstacle to the delivery of quality products or services. Feigenbaum's philosophy and his contribution was the identification of the ten benchmarks which are necessary for total quality competitive success. Juran's philosophy and contribution was through the management role and he specified a procedure for quality improvement by Quality Planning, Quality Improvement and Quality Control. Crosby's philosophy and contribution were through his slogan which was that quality

should conformance to requirement and that quality is free, he also developed the five absolutes to quality. Ishikawa's philosophy and his contribution was the development of quality management using statistical quality control and the employment of the seven tools of quality.

The next step was the tools and techniques of TQM which were explained as a monitor to help managers in monitoring the process to ensure all systems are operating well. This was followed by some of the selected TQM models, such as the Baldrige Model and the European Model. In addition to this there was a review of some quality concepts such as Six Sigma, which is a statistical concept that measures a process in term of defects and ISO9000 as a standard, which has become an international means for many organisations. The stages of TQM implementation were discussed in last section in this chapter.

After understanding TQM, the investigation into the processes requirements for implementing the TQM system within the construction industry becomes necessary. This will be the focus on the next chapter, along with an understanding of what the current situation within the construction industry is in general, and particularly what it is like in Qatar.

Chapter 3: The Status of the Construction Industry in Qatar

3.1 Introduction

Kwakye (1998) described the construction industry as a collection of industries. This could be the best description possible because any completed building is composed of materials and equipment produced from other industries. Therefore, understanding the nature of the construction industry and how its work is an important part of developing the construction process.

According to Hinze (2001) the construction of various types of facilities often represents the culmination of the efforts of several designers. Construction includes all immobile structures, dicks, bridges, sewage treatment plants, and factories. Most of the reshaping of the earth's surface can be attributed to the construction industry. Hinze also indicated that the failure rate for construction firms is quite high, with business failures in construction accounting for approximately 12 percent of all business failures. It has also been estimated that 20 percent of all construction related businesses eventually fail. Failures result from many factors, including overextension of resources, subcontractor default, inadequate labor, acts of God, managerial inexperience, and other economic causes.

The construction industry is one of the industries that are full of problems, and most of these problems are in fact, serious and need a powerful and appropriate approach to overcome or at least to reduce their consequence. The construction industry has several issues that need a huge effort from all parties involved in this sector to address them. Moreover, the construction industry is classified as a one of the riskiest sectors because of the fragmentation of supply chains and the short-term relationships between main contractors on the one side and sub-contractors and suppliers on the other side. Therefore, through this literature review, the researcher tries to answer the question as to whether TQM is the right approach to solve these problems. To address this, many issues will come under discussion in the following paragraphs.

The construction industry occupies a huge economic segment for any country, and has a significant effect on the efficiency and development of other industries. It is characterised

by the participation of many parties and the existence of a proper management system becomes paramount to manage and direct those parties.

The construction project usually consists of three primary participants: the client, the consultant or designer, and the contractor. The process of most construction projects is similar and starts with the client and the consultant's office where the client's requirements are transferred into drawings and specifications (the design stage). The project is usually placed out for bidding to contractors; each contractor attempts to provide better prices than its competitors, and usually, (through not always), the lowest price will win the project. There is a contract agreement that will be established between the client and the contractor under the umbrella of the consultant's office and during this stage, the consultant works as a supervisor for the project to ensure that all work is implemented according to the project drawings and specifications.

The contractors may be classified as general contractors or subcontractors (specialty contractors). General contractors are responsible in all ranges of construction activities and they are responsible for executing most major construction projects. On the other hand, subcontractors limit their activities to one or more construction specialty activity, such as water-proofing, electrical work, heating, and excavation.

According to Hinze (2001), the construction industry is characterized by custom-built projects, whereas standardized methods (mass production) are common in manufacturing. In most manufacturing or service sectors, all activities are implemented in-house, in other words in a closed and shaded area, while a construction project is usually implemented in an open area with a huge number of people, equipments and materials, unpredictable weather, the mentality of different people and a large number of activities on specific and limited time. Therefore, many researchers are working to find out how to apply a quality system which could offer a solution for this environment, such as Burati and Kalidindi, (1991) whose research into the application of TQM in the construction industry has been ubiquitous in the last decade.

Implementing TQM in construction companies means comprehensive change to each and every aspect of the construction process. The process of change is difficult for two main reasons: first the construction industry has been historically reluctant to implement

change. Secondly, a longer time is needed than in other sectors. Sommerville and Sulaiman (1997) analysed the implementation of TQM in construction companies and found that most construction managers tend to lack long-term strategy, and systemic views of production management, and have a relatively conservative position towards managerial changes.

As mentioned earlier, one of the definitions of quality is meeting requirements, and the question which arises in the construction industry is that of whose requirements have to be met. The answer is fourfold: the requirements of designer, supervisor, owner, and constructor. According to Culp, et al. (1993), there is a difference between quality in fact and quality in perception; this means that a product can be of high quality (quality in fact) and yet it may not meet a customer's needs and vice versa.

Since the pace of construction industry development is very fast, and in order to reduce redoing work, the needs for change become increasingly important. According to Love et al. (2000), the industry's problems will remain until each organisation involved in the procurement of construction begins to takes the responsibility for initiating changes within their own organisations. Such change can be initiated through the effective implementation of total quality management (TQM). (Nesan and Holt, 1999).

3.2 Types of Construction

There are several ways the construction projects can be categorized. Hinze, (2001) stated, that there are four broad categories include housing construction, nonresidential building construction, engineering construction, and industrial construction. While, many authors such as Hudson, et al. (2000), have classified the common main types of construction are: building construction, highway construction and industrial construction.

3.2.1 Building Construction

The construction of a building involves several sub divisions and the majority of these subdivisions consist of small renovations, which are privately owned, with the owner of the property normally acting as labourer, paymaster, and design team for the entire project. The important point is that it does not matter what kind of building project is seen

as they all have some common elements of design, financial and legal considerations, whether it is a public project or a privately owned. Construction projects if not managed or executed properly, may undergo cost overruns, structural collapse and/or litigation. People involved in construction to may mitigate these issues by making detailed plans and maintaining the schedule to ensure a positive outcome.

For the construction of large buildings, the client normally hires consultants and ensures his own team of workers and advisors deal with the overall process. This is done to make sure that the project runs smoothly and the required standards and specifications are met. The role of advisor can be as mortgage bankers, project financiers, accountants, lawyers, insurance brokers, architects, designers and engineers.

3.2.2 Highway Construction

The development of infrastructure is dependent on our transportation system. Bridges, roads, rail, airports, harbours, mining, arcades, plazas, high rises and canal system are all included in this category of heavy/highway construction. Usually these projects are publicly owned, but they can be privately owned if it is a case of the development part of the government development scheme. As discussed above in building construction, heavy/highway construction involves design, financial, and legal considerations; however these projects are not usually for profit, but undertaken for the public interest. It is very much taken into under consideration that heavy/highway construction teams should work properly, because this type of construction has a direct affect for the environment and the infrastructure itself.

3.2.3 Industrial Construction

Industrial construction is a very important component of the construction industry. These constructions are usually owned by industrial corporations, which are without question for- profit organisations. These corporations and organisations are in fields such as medicine, petroleum, chemical, power generation, and manufacturing. Highly specialized skills and expertise are needed in this type of construction, as it requires special installation of equipment and machinery. As with the other types of construction explained above industrial construction has legal and contingency requirements.

3.3 Specific Characteristics of the Sector

According to the European Commission Communications (1997), the construction sector is one which is highly regulated, with is specific characteristics which differentiate it from other industrial sectors:

- It is a heterogeneous and fragmented sector, which depends on a large number of very different professions; including diversity of technology, customers, projects, and market sectors.
- Logistical and transport aspects are very important. Construction is one of the most geographically dispersed sectors with marked regional differences.
- The final product is one of the few non-transportable industrial products, adaptable to a variety of uses and representing one of the most durable of human artefacts. It forms the physical infrastructure for living and working, for production and transportation and for essential services. Half of construction projects relate to renovation
- Most construction projects are prototypes.
- Investments in machinery, tools and other elements have to be depreciated over a shorter period than is usual for other industrial sectors.
- The entry-level for new contractors is relatively low because the need for operational capital is small.
- It is closely linked to the economic cycle, and, being generally conducted outside, is affected by seasonal climatic variations;
- The sector is very labour intensive, with high mobility of the workforce and growing skills needed as construction technology becomes more sophisticated. The duration of contracts is often linked to the length of the site construction phase.
- Accident rates tend to be high.
- Finally, the sector generates an enormous quantity of construction waste and demolition material. Moreover, in some Member States the shortage of natural construction materials is a problem.

The above paragraphs reveal that the nature of the construction industry is unique or has different characteristics compared to other industries such as the manufacturing industry.

The large number of workers and diversity of daily activities might be the critical characteristics of the construction industry. Therefore, the needs for adequate management systems used to manage construction company workers and activities, and guide their processes, become more important than even before.

3.4 Management Organisation System in the Construction Companies:

According to Newcombe et al. (2001), proposed the management organisation system in Construction Company as in Figure (3.1). The system includes the following:

1- Strategic system: the strategic system performs the task of deciding and managing the long term direction of the construction companies. The strategic management of the business receive inputs in the form of market intelligence, assessment of the firm's current capabilities and internal, external stakeholder's attitudes.

2- Social system: the social system's sole input is people of various types and levels. Through the processes of motivation, group formation, leadership and committed the system seeks to achieve an output of satisfied committed and involved personnel.

3- Information system: the information system provides the life blood running through the arteries of the construction company.

4- Management system: the management system is shown in Figure (3.1) as central to the whole organisational system. It occurs at three levels in the construction organisation- strategic, administrative and operational each with distinct functions.

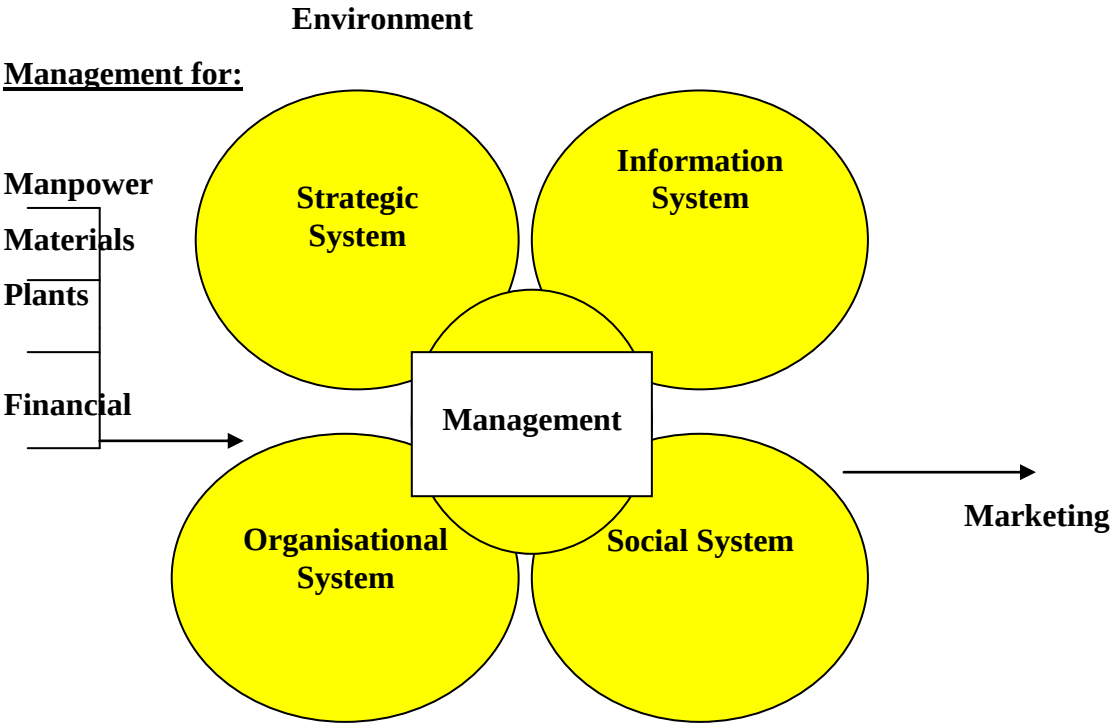


Figure (3.1): Construction Organisation System

Source: Newcombe, Robert, Fellows Richard, Langford David and Urry Sydney, Construction Management in Practice 2001 Blackwell Science Ltd, London

The working environment in the construction industry is crucial to its success. Consequently to be successful within the construction industry, there are five M's that must be available for any construction company to survive: Management, Manpower, Money, Machineries, and Materials. On other hand, a construction company could lose its reputation if five D's emerged: Delay, Defective, Dirty, Dispersed, and Discontinuous. The interesting factor is the relations which exist between the five M's and the five D's because any default in one of the M's could lead to five D's.

3.5 The Importance for TQM in Construction

3.5.1 The Need

Professionals are well aware of the importance and great potential for quality improvement in the construction process. Total Quality Management is not a new concept, since it is an important force in the successful growth of any organisation, such as manufacturing and service industries, as well as being one of the preferred top management philosophies. Therefore, as construction companies intend to increase their

quality and productivity through the TQM philosophy, TQM could be of help in meeting their aim, especially in the last few years since building projects have become complex and more advanced.

According to CII Quality Management Task Force, "companies must institute Total Quality Management (TQM) or become non-competitive in the national and international construction and engineering markets within the next five to ten years." There is no doubt that TQM is a successful management approach in repetitious work or processes and in work with a stable workforce such as manufacturing and services. In construction, there are many variables, and usually each project has a different condition such as cost, location, size, number in the workforce, or weather, so the work is not repeated, but there is still an emphasis on quality provision which must to achieve to satisfy clients.

The demand for quality products is very high in the construction industry, which is why it is often criticised for its poor performance (e.g., low productivity, waste, quality, and health and safety problems). The construction industry is comprised of a multitude of occupations, professions and organisations. Recently, construction companies have started to adopt TQM as an initiative to solve quality problems and to meet the needs of the final customer. As suggested by Oakland and Aldrige (1995), "If ever an industry needed a take-up for concept of TQM it is the construction industry".

A study carried out by Ahmed, et al. (2003) about the comparison of quality management systems in the construction industries of Hong Kong and the USA, aimed at obtaining a general opinion concerning the implementation of a quality management system of construction, and determining whether construction firms have ever made an effort to measure quality improvement. The results of the study indicated that different perceptions towards the implementation of formal quality management systems existed between the two places, mainly owing to the lack of initiative and promotion from both clients and governments. Construction companies in the USA have failed to see the need to obtain the ISO 9000 certification. In Hong Kong, however, the government's initiatives have resulted in a high percentage of companies having certified to the ISO 9000 standards. The results of the study also indicate that, though most companies used different tools for quality measurements, such measurements were mainly for monitoring and for recording purposes.

Many construction companies have implemented the TQM philosophy, while others have rejected the idea because of the perceived increases in costs or because they did not like the change. Love, et al. (2004) presented in their paper the suggestion that contractors should undertake cultural audits before implementing a TQM program, so that corporate objectives and behaviours can be aligned to the goals of the TQM program. Moreover, to illustrate Crosby's phrase "quality is free", the efforts to achieve quality would pay back more than the cost involved in terms of savings in wastes, rework, inspection and returns.

3.5.2 The Critical Factors of TQM Implementation in the Construction Industry

Even though the information on TQM expertise gives very nearly a clear picture of TQM from different angles, the implementation steps for construction companies still needs more work. Sommerville and Robertson (2000) summarised the resistance forces which may be perceived as specific to the construction industry's adoption of holistic total quality management (TQM):

- Product diversity
- Organisational stability
- Holonic networks and change
- Contractual relationships
- Teamwork and management

Jha and Iyer (2006) address the determination of the critical factors affecting quality performance in construction projects. A preliminary survey was based on Indian construction projects. The critical success factors obtained were: project manger's competence; top management's support; monitoring and feedback by project participants; interaction among project participants; and owners' competence. On other hand, conflict among project participants; hostile socio-economic environment; harsh climatic condition; PM's ignorance & lack of knowledge; faulty project conceptualization; and aggressive competition during tendering, are the factors that most adversely affected the quality performance of construction projects.

Another study of TQM's critical success factors was conducted by Ramirez and Loney (1993) and covered US companies from the manufacturing and service sectors. The results of this study showed that the most critical factors are:

- Management commitment
- Customer satisfaction
- Culture change
- Education
- Participation management
- Strategic planning
- Goal clarity
- Error prevention
- Top management steering committee.

Metri (2005) emphasises other critical factors when he analyses the critical success factors of the fourteen most prominent total quality management frameworks. Based on this, he proposes the ten critical success factors (CSF) of TQM for the construction industry. The following ten CSFs have emerged from his analysis:

- Top management commitment
- Quality culture
- Strategic quality management
- Design quality management
- Process management
- Supplier quality management
- Education and training
- Empowerment and involvement
- Information and analysis
- Customer satisfaction.

The European Construction Institution in (July, 1993) published a measurement matrix and guidelines for improvement Total Quality Management in construction. Here, they

identify twelve key objectives that could be considered if the organisation is being a TQM company and they narrowed the word **Construction** as follows:

- C- Commitment & Leadership by top management at location

  This matrix is workable in any location in the company. For example, at sites the top manager may be the foreman, and in the office the top manager may be the department manger or director.
- O- Organises process and structure for TQM

  The aim is to understand how TQM is implemented by structuring oneself in the TQM process for continuous improvement.
- N- Necessary business performance

  The business focus is a part of the overall company operation. The measure relates to a unit's performance against its local targets.
- S- Supplier Relationships (Internal & External)

  This measures how a longer term relationship is being build up with key internal and external suppliers.
- T- Training awareness, education & skills

  To ensure a high quality cost effective result, staff need training in their job skills, safety and environmental awareness, as well as in TQM tools and techniques.

- R- Relationships with internal and external customers

  This measures how a business is developing a longer term relationship with key customers.
- U- Understanding, commitment and satisfaction by employees

  This recognises the attitude taken by staff in the implementation of the TQM process.
- C- Communications

  The proper system is essential to enable rapid dissemination and feedback of management and staff views, proposals, and actions.
- T- Team-work for improvement

  This measures the degree of team- work being used to implement the TQM process and to solve problems causing barriers to efficient working practices.
- I- Independent certification of quality management system

The Full independent certification provides recognition of a quality management system.

- O- Objective measurement and feedback
  Measurements are necessary to judge what progress has been made on the TQM process.
- N- Natural use of TQM tools and techniques
  This measures how well the employee uses the TQM tools and techniques in which they have been trained.

It was established from the literature review discussed above that there are common factors considered to be critical success factors for TQM implementation, such as management commitment, customer satisfaction, and training. Therefore, the level of successes in the implementation of the TQM programme depends on the level of awareness and implementation of these factors.

3.5.3 Cost of Poor Quality in the Construction Industry

The cost of poor quality in construction is not limited to the cost of re-work or spending extra money, but it goes beyond that to establishing the company's reputation amongst current or future clients and it becomes very difficult if a bad reputation is earned. According to Oakland (2006), the cost of quality consists of the three factors, the prevention costs, appraisal costs and failure costs.

Quality in construction is different from quality in manufacturing or service sectors because the owner has a greater and direct influence on the quality of the completed project. The main reason for this is that the owners have a greater input in many stages of pre-construction such as design, specification, while in manufacturing or service the input is restricted to standard and market requirements.

Many studies recognise that the costs of poor quality in construction projects are more than other related costs such as design, sales, production/ operation, and other activities, which can be budgeted, measured and analysed, Oakland (2006). The construction process is fragmented and, owing to the involvement of many parties its operations become more complex and everyone involved in the project incurs some costs, although

these costs may or may not be recorded owing to the interest of relative jobs. A detailed knowledge of recording the costs of quality is relatively important as it is the major factor of performance measurements and the roadmap towards continuous improvement.

Lack in communication, poor workmanship and lack of site supervision are causes of poor quality. Quality in construction is directly related to time and cost, and vice-versa. A poor quality managed project can result in extra cost and time extensions; a poor time and cost controlled project can affect the conformance of requirements, i.e. quality. It is therefore vital for project managers to understand the client's requirements in terms of cost, quality and time.

The cost of quality can be divided into two areas: costs related to not doing things right, and costs related to trying to prevent them from going wrong, as shown in formula : Cost of Quality = Cost of Non-conformance + Cost of Prevention. The cost of non-conformance includes the direct and indirect costs and emerges from not doing things right the first time, for examples are accidents on sites, being late, errors, and poor workmanship, which then lead to rework, penalties, increased insurance costs, and removal of defects.

Measuring the cost of poor quality is important for several reasons such as that it exposes waste and the need to rework for all to see; it serves as a driving force to improve company operations and determines the progress of a company in reducing the cost of quality. The removal or rectifying of poor quality has become a normal process and is repeated daily in construction projects, and most re-work processes are difficult and need a significant time to repair, so there is no doubt that the cost of achieving quality is negligible when compared with not achieving quality. This fact is clear for everyone involved in construction industry.

3.6 State of Qatar

The State of Qatar is located half-way along the west coast of the Arabian Gulf, east of the Arabian Peninsula**.** It is a peninsula that extends over an area of 11,437 sq km. Figure (3.2) Geographic coordinates are 25 30 N, 51 15 E. The population of State of the Qatar has increased by a modest 2 % since a long time up to 2000, to reach 650 thousand at the end of 2000. Owing to the increase in immigration of huge numbers of workers to the state of Qatar, this percentage increased to reach 1.2 million at the end of 2007. This rapid increase in the workforce is the result of various facilities that were brought into being and provided by the State. The construction industry in Qatar is becoming one of the fastest booming industries, especially in the last four years. The sittings of different types of projects, such as five-star hotels, shopping centres, commercial and modern residential buildings, are the clear evidence of this boom. In Table (3.1) there is a summary of the general information about the State of Qatar.

Figure (3.2): Location of State of Qatar within the World

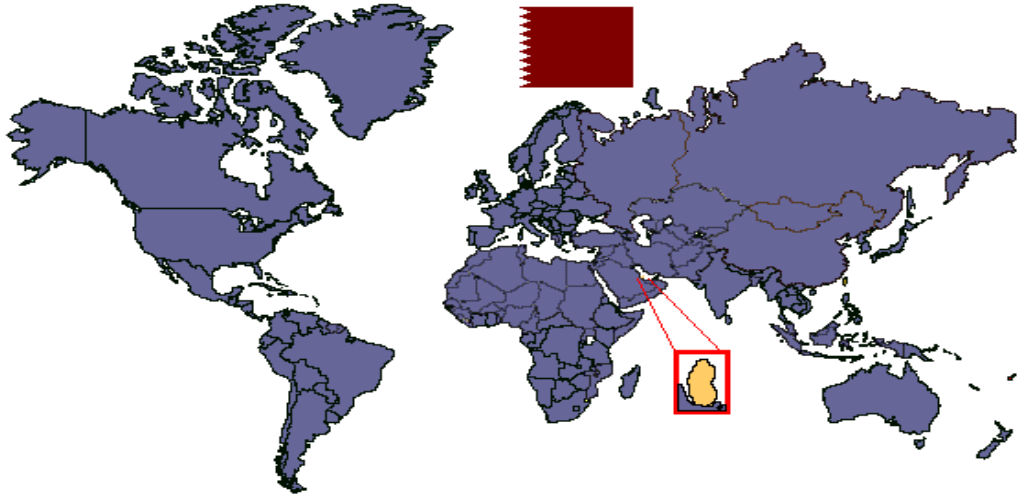


Table (3.1) General Information about State of Qatar

Total Land Area:	11,520 km^2
Land boundaries:	60 km
Coastline:	563 km
Capital:	Doha
Other Large Cities:	Ar-Rayyan, Al- Wakrah
Official Language:	Arabic
National Currency Unit:	Qatari Riyal (QAR)
National Day:	September 3

The state of Qatar one of the lowest populations around the world and almost one of the highest booming countries, and aiming to solve the population problem which is not fit the rapid development of the construction movement. Therefore, Qatar seeks to increase their population by facilitating the immigration to the state. The main issue of this immigration is the entry of a number of cultures which are different from the Qatar society.

3.7 The Nature of the Construction Industry in Qatar

3.7.1 Consultant Offices

Generally, consultant offices (some times known design offices) in Qatar are similar to those in countries. There are three main functions of consultant offices: the first function is to carry out the design of the project; the second is the preparation of the project documents; finally, there is supervision and quality control, so they have to ensure that the project is constructed according to drawings and specifications.

3.7.2 Suppliers

Construction projects in Qatar have been booming in last few years, and this boom has required enough suppliers to cover the needs of these projects. The construction industry in Qatar is facing a problem with suppliers because of the shortage of raw materials that

are supplied by national suppliers. Therefore, the Qatar government should allow for international suppliers to meet and cover this shortage.

Cement and aggregates are the main and critical raw materials used in construction projects; therefore, the government is strict in the quality of these two materials. From the literature studied by the researcher, it appears that many suppliers for these two materials have complained about the tests or certificates required to gain approval of their materials. These complaints arose from the costs they have to pay to obtain materials of the required quality, and they have ignored the benefits they will obtain in the long term regarding the improvement of their materials.

3.7.3 Owners

Owners or Clients are those who own the projects, so they are the targets for the contractors. Owners or clients, sometimes become an obstacle to implementing TQM in construction companies because most owners interface with the aim of accelerating the project's progress regardless of the quality of the work. The contractor is caught between the client's requirements and the requirements of implementing a quality process. Therefore, the owners interface in the project should be without any disruption to the construction company's quality plan. Contractor-client relationships in Japan are normally long term (Abdulaziz, 2002). Most clients look for the cheapest contractors rather than the best ones. This has been the case in Qatar for long time, while currently there is some awareness on the part of the clients, who are beginning to identify and classify contractors according to their reputation and price.

3.7.4 Sub-Contractors

The sub-contractors, sometimes known as specialty contractors, include electrical, mechanical, excavation and demolition contractors. They support the main contractor in the execution of the project. In the state of Qatar, subcontractors, such as electrical contractors, must hold a licence from the Qatar General Electricity & Water Corporation. In some cases, aiming for better quality or financial saving, clients eliminate some tasks from the main contractor's agreement and make another agreement with the sub-contractor, and in such cases, the main contractor is not responsible for any work not

implemented through him. For successful and effective Total Quality Management (TQM) implementation, and since subcontractors represent a large part of the construction industry, subcontractors also have to be effectively involved in the construction process with the main contractors.

3.7.5 Constructions Companies

The function of a construction company as the main contractor is to coordinate all the tasks in a construction project. The construction companies in Qatar should be classified if it wants to compete in the governmental projects. According to the Central Tender Committee (CTC) as summarised in Table (3.2), construction companies in Qatar are classified into various categories such as Building and Maintenance Works, Contractors of Water, Road and Sewerage Works. Each category is classified into a certain number of grades, such as (A), (B), (C) and (D).

Table (3.2): Grades and limitation of the all categories

Grades	Points limitation (points)	Project value limitation. QR Million
A	81-100	30 – 100
B	66 – 80	10 – 30
C	51 – 65	3 – 10
D	36 – 50	1 – 3
E	15 – 35	0.35 – 1
F	5 – 14	Up to 0.35

The classifications are actually based on several criteria including financial situation such as the contractors with different grades must confirm their capital and financial situation from the external auditor, management level, such as chairman and department mangers, technical level such as head of engineers including their degree and background, number of employees, number of projects executed, size and amount of equipments, the establishment that a company has, and the only measure for quality and safety is the existence of a quality and safety supervisor in the establishment or company. Therefore, at the very first stage, we have to stop to understand the value of quality in the view of the decision makers.

3.8 Challenges with the Implementation of TQM in Construction Companies in Qatar

The manufacturing industry has implemented and developed the concept of Total Quality Management (TQM). These owing to the nature of the repetitive operation of the manufacturing process, which are not existed in the construction industry. But the literature shows that the TQM is not only temporary concept applied in selected processes, TQM concept is comprehensive culture changes including tools, techniques and principles might be adequate for any industries and organisations, including the construction companies. According to Love et al. (2001), they identified the critical barriers in implementation of the TQM in construction companies included:

- Perceived threat to foreman and project manager roles
- Disinterest at the site level
- Lack of understanding of what TQM was, particularly on site
- Geographically dispersed sites
- Fear of job losses
- Inadequate training
- Plan not clearly defined
- Employee scepticism
- Resistance to data collection (e.g. rework costs, non-conformances material waste.

Construction companies in general face a number of challenges. From the researcher's experience in the construction field and pilot discussions with some clients, he has found that there are three parameters which are very important in the view of clients: project cost, project quality, and project duration. These three parameters could be angles of the project triangle, and all have equal importance. Therefore, the need for a proper system in the construction industry is of importance; TQM could be one of these solutions if implemented in the right way. The lack of literatures related to the implementation of TQM philosophy in construction companies in Qatar, and aiming to better understand the situation, leads to conduct the interviews with the people who are involved in the construction companies in Qatar.

According to Rad Ali (2006), in the study about the impact of the organisational culture on the successful implementation of total quality management, he listed the barriers to successful implementation of TQM, and illustrated that the insufficient wages and salaries, cultural barriers, lack of education and training lack of efficient and effective employees for TQM implementation, lack of mechanisms for empowering employees, instability and mobility of senior managers, lack of automation of process inspection and control, lack of legal forces for providing quality of health care, lack of long term and strategic planning, non clarity of strategies and objectives, lack of physician involvement, and lack of patients knowledge about health care processes are the main obstacles for successful implementation of total quality management philosophy.

3.9 Qatar Vs. UK Construction Companies

The selection of the UK construction industry to be a benchmark for this research has emerged for many reasons. According to the Construction Industry Report in (2005), they described the construction industry's Gross Value Added in the EU by each country as in Table (4.2). The construction industry in the UK has a major position in the UK economy. It is responsible for 8% of the GDP and employs more than 2 million people, According to the Department of Trade and Industry, (2006). With a turnover in excess of £170 billion, the construction industry has a high political profile, especially regarding its role in the building of hospitals, schools, universities, homes, and other facilities.

The British construction industry has a strong foundation and experience, as stated by (Lin, 1993 in Pheng, 1996). Lin appears to suggest that there are tremendous benefits for TQM in the construction fraternity. These benefits are:

- TQM achieves real cost savings arising from fewer errors, consequent reduced cost wastage and reduced defect liabilities.
- It also leads to greater client satisfaction which, in turn, enhances the prospect of repeat business.
- Greater job satisfaction can be obtained for the consultant, contractor, subcontractors and direct employees. This leads to high morale and productivity.

- Effectiveness will be achieved through systematic and logical analysis of the construction process; improved communications; feedback at various stages of the building process; and audit at strategic intervals.
- TQM provides the psychological tool to condition employees to the correct "continuous improvement" or Kaizen attitude required for their work.
- As a powerful management device, TQM forges total participation by all parties at every stage of the life cycle of the building process.

As previously mentioned *Cost, Quality,* and *Duration* of projects are the three parameters in the view of clients who considered problems existing in the construction companies in Qatar. A pilot study was conducted with the people who participated that work in construction companies in Qatar in order to compare these parameters to the situation in the UK. These problems could be summarised as follows:

- **Cost**

Issues of cost arise owing to the fixed contractual amount during the duration of construction and to changes in prices of materials. This is certainly the case in the construction industry in Qatar. Many construction companies face this problem as contractors sign the contract with the client with a profit margin of not more than 10% suddenly, the price of materials may go up by 30-40%. However, in the UK, even though the profit margin may be low, there are numerous suppliers of construction materials, so the bargaining power of suppliers is very low.

- **Quality**

Provided that, achieving quality in a construction project is very difficult, due to the number of parties involved in construction activities. In Qatar, the poor quality relates to additional factors such as shortage of skilled workmanship and unclear quality standards, so each consultant proposes his own specifications. In contrast to the UK, there is a quality standard and all large construction company's follow this standard. Tyler and Frost, (1993) pointed out that quality assurance (QA) has only recently been taken seriously in the UK.

- **Duration**

It is an apparent fact that almost all projects in Qatar finish after the agreed time, so this issue is according to the clients basically related to two main reasons. The first is the shortage of materials, and the second is that most projects tend towards the fast track approach, and the stated duration of projects is too short. On the other hand, in the UK this predicament exists on an every day basis, and this fact is discussed by the Institution of Structural Engineers (March 1991), as stated "Public belief that many projects run late and over budget".

Table 3.3: Construction Industry Gross Value Added in the EU by the Country (€ M) 2004.

Country	(GVA)
UK	96,690.5
France	87,812.4
Germany	82,670.0
Spain	80,870.0
Italy	73,116.9
Netherlands	24,765.0
Austria	15,995,5
Greece	12,774.0
Belgium	12,460.3
Republic of Ireland	11,855.5
Sweden	10,910.9
Poland	10,040.4
Denmark	9,342.3
Portugal	7,943.0
Finland	6,989.0
Czech Republic	5,440.6
Hungary	3,491.3
Slovakia	1,712.0
Luxembourg	1,488.1

Slovenia	1,291.7
Lithuania	1,164.2
Cyprus	970.0
Latvia	581.0
Estonia	534.2
Malta	178.6
Total	561,087.4

In their study on the performance of contractors in Japan, the UK, and the USA, Xiao and Proverbs (2002), found that over 90 % of Japanese companies investigated implemented TQM. This compared to 53 % in the UK and 41 % in the USA. Moreover, all the Japanese companies investigated have some kind of quality assurance certification, compared to 81% of UK companies, and 10% of US companies. The superiority in quality performance may originate from their deep- rooted quality consciousness, close working relationship with their subcontractors, and fully developed TQM system.

On other hand, from the researcher's insight into the construction sector in Qatar and from the literature review, there is no single construction company that has adopted the TQM system up to end of 2008, even if there are some companies that have quality systems such as ISO. Successful construction companies in developed countries understand how TQM systems facilitate their continuous improvement and should encourage construction companies in Qatar to adopt the TQM system.

3.10 Summary

This chapter has described the current situation of the construction industry in general with particular focus on the status of the construction industry in Qatar. Types of construction in the world almost the same and the differences are only in the methods implemented or materials used.

The construction sector has some specific characteristics which differentiate it from other industry such as:

- Sector is fragmented
- Logistical aspects are important
- Construction projects are prototypes
- Starting capital is small
- Labour is intensive
- Accident rates are high

The demand for quality products is very high in the construction industry, so today the need for a proper quality system has become more important than ever before. Therefore, many construction companies have implemented the TQM philosophy globally.

The most common critical success factors of TQM implementation in the construction industry are summarised in the following:

- Management commitment
- Customer satisfaction
- Culture change
- Education and training

Construction companies in Qatar as other countries face some challenges such as project cost, project quality and project duration. The concept of total quality management in Qatar is still not clear and disordering the concept can be confused with other quality concepts and in particular with the ISO system. Adoption of TQM program into construction companies in Qatar could be the right direction towards rectifying the problems and improves the current situation.

Chapter 4 Research Methodology

4.1 Introduction

This chapter discusses the methodology used in the research. As outlined in Chapter 1 the main objective of the thesis is to develop a framework for the implementation of Total Quality Management (TQM) in the construction industry with special focus on the construction companies in the state of Qatar.

After identifying the research problem and reviewing a number of research approaches, it became clear that the appropriate method of the current research is a descriptive method, "descriptive research tends to use survey techniques" Hakim, (1987), which realise on the reality of the phenomenon as it exists in reality, and then clearly describes it by collecting main characteristics and data about the phenomenon. Finally, it is classified and organized to achieve the conclusions that contribute to the understanding of the situation and building an improvement cycle. The use of a survey allows associations between the variables to be mapped out and measured to show whether the associations are strong or weak. (Harness, 2009).

The objective of the descriptive research is "to portray an accurate profile of persons, events or situations" (Robson, 2002). Therefore, the researcher used the descriptive method of analysis, because "it is necessary to have a clear picture of the phenomena on which one wishes to collect data prior to the collection of the data." (Saunders, Lewis and Thornhill, 2003). Therefore, interview questions were employed to gather information about the present situation of the construction industry in Qatar.

4.2 Panorama of the Research Methodologies

The entire research data was gathered either through primary research or through secondary research keeping in view the main and objectives of the study. Indeed, there were some limitations to the collection of data. The overall research strategy applied in the thesis is interpretive. Data has thus been collected and analysed in the light of the theoretical understanding of the researcher and the conceptual orientation of the time and location for data collection.

4.2.1 Primary Data

The research methodology is divided into two separate groups, primary data and secondary data analysis. In general there are two techniques used for collection of primary data, direct and indirect techniques. The direct techniques include qualitative research techniques, such as observation and in depth interview, whereas, indirect techniques include quantitative research techniques, such as face to face, phone conservation, and mail, as in Figure (4.1).

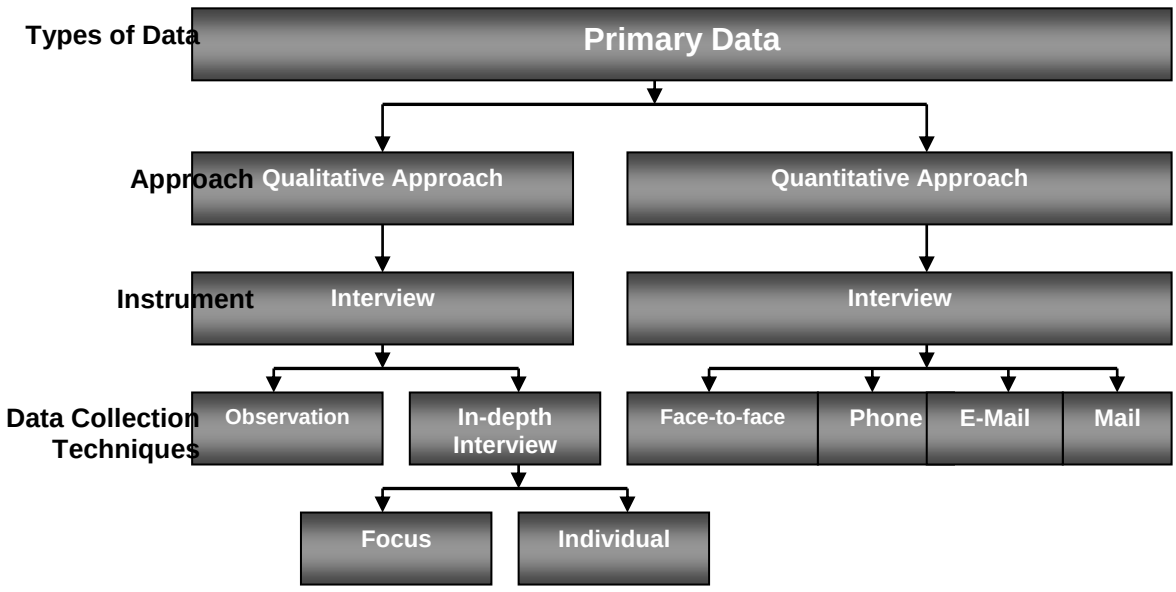


Figure (4.1): Panorama of Primary Research Methodologies

Source: **Fleischman, L. (2000)** ***Is Wal-Mart a Real Threat for Large European Grocery Retailers,*** **Dissertation, pp.33 which she further adapted from Craig, C.S, and Douglas, S. P. (2000)** ***International Marketing Research,*** **pp.169-227.**

4.2.2 Secondary Data

Secondary data provide a good starting point for research and helps to define research problems and objectives. The secondary data include raw data and published summaries. It also include both qualitative data, such as biographies, diaries, newspapers, journals, books, novels, policy statements, planning documents, reports, historical and official documents and quantitative data such as; national/local government statistics, reports, planning documents, trade association reports, professional bodies research, academic and research institution statistics etc. are used for the analysis of research question, as in Figure (4.2). Within business and management research such data are used mostly in case study and survey- type research.

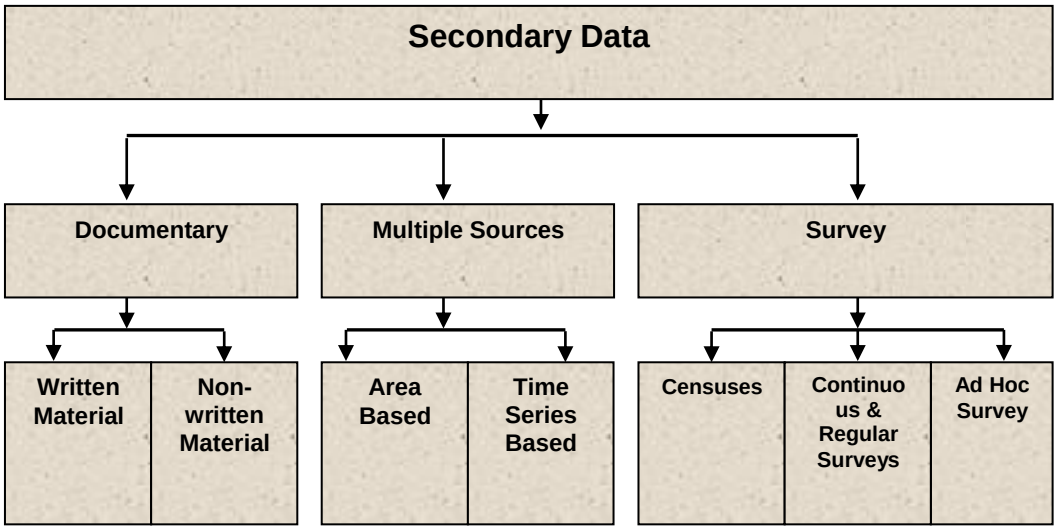


Figure (4.2): Types of Secondary Data

Source: **Lewis, P., Saunders, M., and Thornhill, A. (ed.) (2003)** ***Research Methods for Business Students.*** **Pearson Education Limited, Harlow, Essex, United Kingdom.**

From the literature review and the interviews, it was envisaged to build a platform of the research and an attempt is made to understand the main theoretical and practical elements of the research by:

1- Identify the problems and difficulties faced during the development of the construction companies in state of Qatar.

2- Identify the administrative and technical missions of managers in the construction companies.
3- Determine the appropriate research tools.
4- Achieve the requirements that are necessary for successful implementation of TQM: continues improvement, leader participation, team work, customers' satisfaction, quality tools and techniques, availability of resources and statistical monitoring.
5- Determine the appropriate quality model that is applicable to the construction companies in Qatar.

The lack of the literature related to the concept and implementation of the TQM in construction industry in Qatar, directed the researcher to collect primary data by conducting face to face interviews with the people who have a direct contact to the construction industry, as it was envisaged that the interviews process will provide a closer look to the real-process and help in identifying the processes and procedures from the people, who are part of it. Therefore, the direct interviews were conducted to build up a platform to identify, how well defined are the processes and procedures, how is the management engaged, what understanding of the quality issues exists among the workers and managers, and with the main aim of identifying the barrier that may exist during the implementation of total quality management framework in the construction company identified as a client in Qatar.

The current research differs from previous studies, as it seeks to improve the efficiency of the construction companies' activities including the management's processes through the implementation of TQM. Furthermore, an attempt will be made to suggest a TQM framework for the management of the client's construction company. Therefore, it will be important to obtain in depth knowledge of the existing procedures and processes, and finally employ qualitative and quantitative methods for the data analysis.

4.3 Literature Review

The literature review was undertaken to answer the first research question which is "What is Total Quality Management", second research question which is "What are the requirements for implementing TQM within the construction industry in general?" So it covers all aspects and detailed understating of the TQM concepts. In addition to the

situation of the construction industry in general with more focus will be put on the state of construction industry in Qatar. TQM concept including the historical development of the TQM, tools and techniques, models and comparing to the other quality systems are covered in detail in Chapter 2. Status of the construction industry in general and summary of the previous studies related to the implementation of the TQM in construction industry are discussed in Chapter 3. Most of the data for literature review was collected from the British Library, and articles found through internet sources.

4.4 Research Resources and Tools:

Various research resources and tools were employed in this research to collect the required data and these resources are:

- Company documents and statistics related to the research objectives.
- Literatures and researches related to the research questions
- Interviews with employees of construction companies in Qatar
- Questionnaire to collect data and information necessary for research study, statistical analysis, and get results.
- Internet search

4.5 Population

According to General Secretariat for development planning of Qatar 2005, the construction industry in Qatar has more than 1146 companies with different categories and specialty. Since the numbers of construction companies are huge, the researcher decided to select the case study through authorized government body which was the Central Tender Committee (CTC) in State of Qatar, who classified construction companies to the different grades or levels, based on many factors as detailed in Appendix (A). Therefore, the main aim of data collection in stage two is to select a case study with special characteristics such as size, history, flexibility and access. According to Bennett (1986), Yin (2002) listed the four stages of case study method one will involve in as follows:

- Determining the present situation
- Gathering information about the background to the present situation
- Gathering more specific data to test alternative hypotheses about the important factors in the present situation.
- Presenting recommendations for action; and where you have time and the power to have influenced events, evaluating the outcomes of these recommendations after they have been implemented.

4.6 Sample Selection

According to Saunders, Lewis and Thornjill (2003), sampling provides a valid alternative to a census when:

- It would be impracticable to survey the entire population, due to budget and time constrains
- Reasonable data is collected but results may be required quickly.

The sampling techniques can be further classified into two types:

- Probability sampling
- Non-probability sampling

The main differences between two above types is that non probability sampling does not involve random selection and probability sampling does. The technique of probability sampling is based on the assumption that the sample will be statistically chosen at random. While the technique of non-probability sampling provides a range of alternative techniques such as accidental or (convenience) sampling, snowballing, common sense sampling and quota sampling. Therefore, the non- probability techniques were employed in this study because the sample of cases selected was accidental. According to Soniya and White (1998), the sample is accidental when a person is sampled by accident because he/she happens to be available. In addition, Burns and Grove (2005) stated that in accidental sampling, subjects are included in the study because they happened to be in the

right place at the right time. Available subjects are simply entered into the study until the desired sample size is reached.

Rumsey, (2003) listed the most important criteria in selecting a good sample: it represent the target population, selected randomly and large enough for the results to be accurate. The population of the study is around 32 employees from the construction company selected. According to Henry (1990), for population of less than 50 cases, then the probability sampling should be avoided and should collect data on the entire population as the influence of a single extreme case on subsequent statistical analysis is more pronounced than for large samples. According to Saunders, Lewis and Thornjill (2003), the economist's advice of a minimum number of 30 for statistical analysis provides a useful rule of thumb for the smallest number in each category within overall sample; researchers normally work to 95 percent level of certainty.

The interview questions were prepared in light of both the theoretical and experimental aspects. People selected for interviews were from deferent levels of the company's organisational structure, and an attempt was made to collect as much data as possible by identifying the real-time aspects of the current processes and procedures of the company identified as client. A total of 32 interviews were conducted, where 3 responses were excluded because they gave answers that were unrelated and non-specific to the interview questions and 29 responses were valid as in Table (4.1):

Table (4.1): Sample of Interviewers

Professions	Numbers
QHSE	8
Engineering	6
Administration	11
Quantity officers	4
Total	29

The above Table (4.1) indicates that the samples of interview included in this study were both form administrative and technical departments and were involved in the

development, implementation and administration of the company. In addition, they were also involved in monitoring the performance of the company. The main aim of these interviews was to collect data that can be analysed owing to the understanding of the real-time processes of the construction company identified as a case study.

4.7 Data Collection Procedures

The process for the carrying out the survey is one of the important steps in the research procedures and it comes after the survey has been designed and the participants have been selected. The researcher adopted four main stages to collecting the data: pilot study, case study selection, interview questions (qualitative methods) and questionnaires (quantitative method).

Stage 1 Pilot Study of the Survey

(Hallmark, 1994 in Marcella, et al. 2003) stated that data collected through either questionnaires or/ and interviews has equal validity. Therefore, a pilot study was conducted through a number of construction companies in State of Qatar, by conducting telephonic conservation with their decision makers to analyse how comfortable and willing they will be to adopt and implement quality procedures within their companies. It was also asked to the researcher's colleagues who were working in the construction industry, to ensure that the questions were clear and understandable. Oppenheim, (1972) stated that the pilot study is a good opportunity to gather data on the reliability and validity of the questions and it is more accurate and precise, if the questions that are asked are clear and understandable.

Stage 2 Selection of the Case Study

According to Yin (2003), the case studies are preferred strategy when "how" or "why" questions are asked, when an investigator has little control over events". The last research question is "How effective are TQM principles when implemented among construction companies in Qatar?" Therefore the case study is the proper selection to answer this question. The case study can provide practical advice to Qatar construction companies in implementing in practice the proposed TQM model.

In February 2008, a list of majority of the construction companies in Qatar was collected from Central Tender Committee (CTC). In addition, supplementary information about the construction companies was collected through the researcher's previous colleagues in construction industry in Qatar, details of which are provided in Appendix (B).

After collecting a reasonable size data through various sources mentioned above, in June 2008, the decision was made to select Al-Jaber Trading and Contracting (JTC) as a case study for this research. The selection is based on the following considerations:

- Company has implemented a quality management system.
- Company has a ISO 9000 certificate
- Company is willing to cooperate and required data will be made available throughout the research process.

There were limitations in selecting the companies that can be evaluated in this study due to a number of factors, which were considered beyond control of the researcher and are described here below.

1. Majority of the construction companies in Qatar (Small to Medium to Large size) are family owned and most of the documents, in most cases even the annual reports, financial details, organizational structure are classified and only available to the family members. Even the senior managers (including the operational mangers) do not have access to these documents, let alone the availability in the public domain.

2. It was decided to identify a large company in Qatar as a client and the criteria for the selection of this company was a large company having more than 5000 employees. Hence, the company selected as the client / case study was ranked number two in Qatar with more than 8000 employees, had a rich history of growth, flexibility in operations and the availability of access in all sections at all levels of management was another important and crucial requirement. This was not an easy task and the strict criterion employed in this study dictated the exclusion of a number of companies in Qatar as clients, as access to the classified information proved difficult

and nearly impossible in most of the cases. The only reason the researcher managed to have access to the classified information of the company employed in this study was due to good and old relationship with the company's owners. The owner of the company passed on directives to all senior managers to make the entire information available to me for this study. It was ensured to the owner that the information collected in this study will be treated with utmost confidentiality and remain confidential. It is also important to note that this company is considered as one of the most organized and developed company in Qatar.

3. There were process and time limitations as well, the company director emphasised that the interviews can only be allowed during the month of July and August, as this is regarded as their off-peak season. Therefore, the timing constraints dictated for the interviews to be conducted during the allowed time-period of July and August, which was the holiday season for a significant number of employees in the company. Although, the researchers managed to obtain sufficient sampling, but the unavoidable wait for the interviews to be completed was a temporary barrier. The sampling exercise gathered pace when they arrived back from their respective holidays and became available for the interviews and in few cases continued with the incomplete exercise.

Stage 3 Developing the Interviews Questions

The main aim of the interview questions is to gather information in order to analyse the selected samples of population. Face to face interviews are important at this stage due to the value and quality of information required. According to Buckley, et al. (2000), the interview has remained the most popular widely used selection tool in the selection process. The most popular approach is to treat respondents' answers as describing some external reality (e.g. facts, events) or internal experience (e.g. feelings, meanings). Following this approach, to ensure the accuracy of the interpretation, it is appropriate to build into the research design various devices. (Silverman, 2010).

The documents and literatures related to the construction industry in Qatar is very rare, and in order to answer the research question no.3 which is "What is the present situation

of construction companies in the State of Qatar"?, and research question no.4 which is "What are the critical problems faced by construction companies in the State of Qatar vis-à-vis the implementation of TQM?". Therefore personal interviews with the construction companies' employees were implemented to understand the current situation and the challenges that are faced by the construction companies. Moreover, the responses of the interviews, gave the researcher a better vision of the level of implementation of Total Quality Management in construction companies in Qatar.

Most of the interviews were carried out over the duration of three months, and covered 32 employees at different levels. It was decided to use critical incident technique during this stage of interviews. In addition to the interview as sources evidence, the others sources for evidence basically from company documents and researcher observations were also employed.

The process used for the selected case study was started in July 2008. The interviews started by giving a brief introduction to the aims of the interviews. In order to give interview even greater importance, the researcher decided to start the interviews with the top director of the company. But unfortunately, the director declined this request and suggested to keep him as a last person to be interviewed in sampling exercise. This was not due to the lack of commitment or participation on his part, as he gave clear instruction were given to the development manager to coordinate and facilitate the interviews process and make all the resources available in a timely manner.

The first observation, which emerged before even the interview began, was that most of the employees in client's construction company are behind their schedule in performing their duties. Therefore, arranging the appointment to meeting the employees was most difficult step to conduct the interviews, as they were always busy or occupied in a number of things. It was clearly identified as a cultural barrier that was slowing down the process in JTC.

The interview with the development manager was the starting point to penetrate in depth to JTC. The interview process as more than ten hours spanned over five days but with other interviewees the duration was within one hour for each person. The language used was English, but since some of the employees' English language was poor, the researcher

was flexible with them to use their language and translate it to English straight after the interviews.

The interview questions were categorized into two parts, part one consisted questions related to the employees and part two consisted questions related to the construction industry and total quality management concept. A total of 12 questions were answered by the 29 interviewees and 3 interviewees were neglected because the responses language wasn't clear and there were difficulties in translating their answers. A total of 348 answers were collected.

The first two questions are designed to understand the job specification of the person and trying to link it up with the organisation structure. In addition, it also allows to determine the basic education of the employee, and whether has his/her training needs were identified appropriately at the early stages of employment. The responsibility of the company is to ensure that the training needs of the person are met to satisfaction (fit for purpose).

Questions 3-7 are designed to find out what type of management communication structure does exist and it was considered very important, to identify the stages at which the communication becomes a major barrier. The successful exchange or sharing of information between two or more than two entities using any defined set of common parameters is known as communication. It is regarded as the most essential and valuable trait a successful project manager possess. Through effective communication, leaders support individual and team achievement by creating explicit guidelines for accomplishing results and for career advancement. Moreover, looking at the meaning of quality and how it is integrated within the system, the implementation process is crucial making it equally important to evaluate the quality concept from different angles through the constructed questions.

The project plan through processes is an extremely important aspect of quality. The *initiating* process occurs at the beginning of the project by acknowledging that the project should begin. Initiating starts with senior management granting approval to commit the organization's resources to working on the project. *Planning* is the process of formulating and revising planning documents to be used throughout the project. Planning must necessarily encompass all areas of project management and considers budgets, activity

definition, scope planning, schedule development, risk identification, staff acquisition, procurement planning, and more. *Executing* involves putting project plans into action. During this process, the project manager should coordinate and direct project resources to meet the objectives of the project plan. The executing process keeps the project plan on track and ensures that future execution of project plans remain within project objectives. Because the execution process group will utilize the most project time and resources, costs are usually highest during this process phase. The *Controlling* process group involves using project performance measurements (metrics) to determine if the project is performing to plan. If the variances do exist, corrective action is taken to realign project objectives with the project plan. The project control system should focus on project objectives, with the aim of ensuring that the project mission is achieved. Control should be exercised over what is important, focusing on timely response. The *closing* process group involves the collection of project documents and historical information for storage and future use, including lessons learned. The documentation collected during the closing process can be reviewed and utilized to avert potential problems on future projects or programs.

Questions 8-12 are the main themes of the thesis and attempt to analyse the existing knowledge of TQM as an individual and as a whole within the organisation. Furthermore, it is deemed important to discover what particular elements of TQM are known and which ones need to be introduced and implemented. It is important to identify those elements from questionnaires and develop a system that is interlinking those missing elements with the procedures to be incorporated in the entire organisation within quality framework. The questions that were asked are given here below:

JOB TITLE: ----------, DEPARTMENT----------

1- Can you describe your current job/ position in the company and your responsibilities?
2- Tell me about your background. How did you get to this company/ job? (Recruitment quality) or (Recruitment process).
3- Tell me about the people you work with/ your boss.

4- How do you define quality? What does quality mean to you?

5- Can you give an example of situations where you had a problem / issue with quality? (Which ended in poor/ good result)?

6- What challenges do you face in your job that is specific to the construction industry alone?

7- How do the attitude / implementation of quality in your industry differ in this country and any country you worked with?

8- How you are familiar with the TQM concept?

9- Identify (list) three important factors, which in you opinion may be considered as barrier to continuous improvement.

10- What evidence is there which indicates that the organisation is capable of meeting customer requirements..?

11- The question about critical incidence related to the issue, can you give an example where you have bad quality or can you give me an example with situation there was problem but at end you mange to have good quality result.

12- What factors have an impact on quality in construction industry in Qatar?

Stage 4 Developing the Questionnaires

The interviews revealed that there is a lack of awareness towards the TQM concepts and principles. It became apparent that there is confusion in understanding the quality philosophy and advantages it can offer. This led the researcher to presents the TQM principles as a questionnaire to conduct detailed survey. The questionnaire is the basic tool for the field study, and is used in large scale by the researchers, to get the facts about the circumstances and methods that already exist. The main reasons that led to use of the questionnaire as a tool for field research are the following:

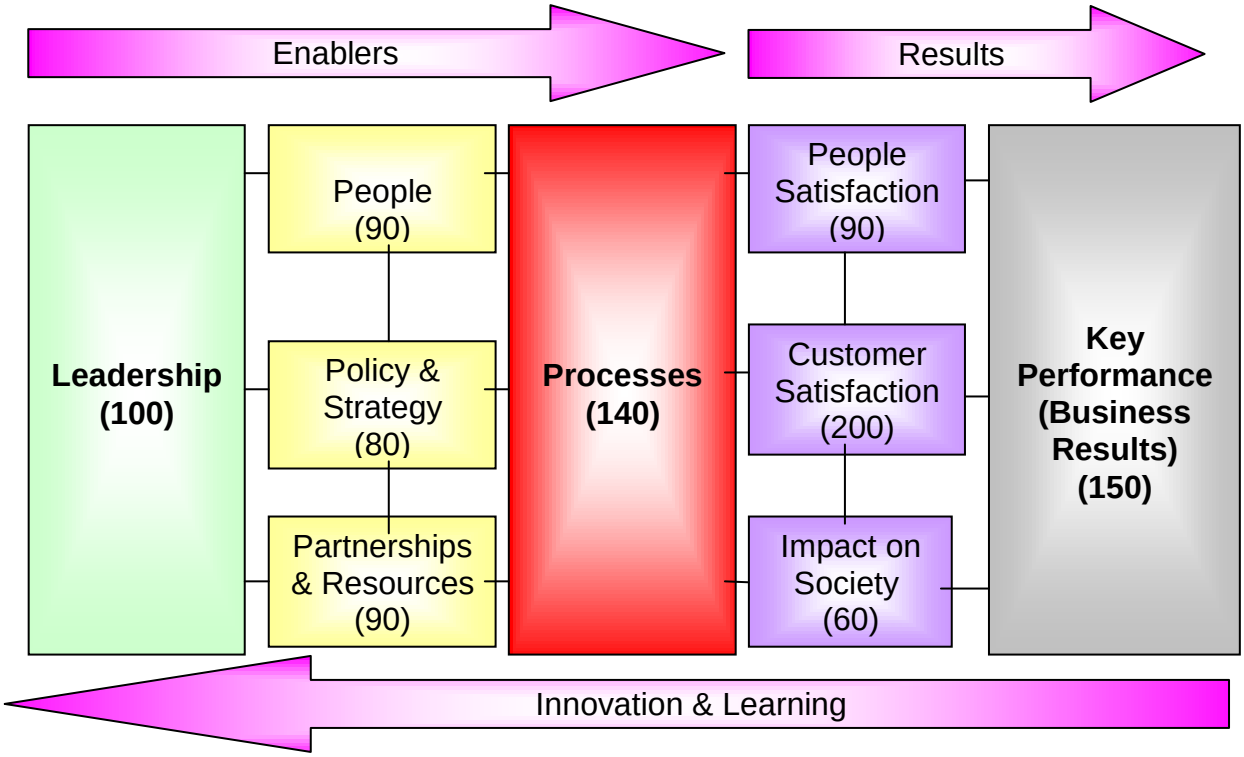
- Access to information that cannot be obtained from other resources such as official records.
- Give enough time for the questioners for thinking before answering.
- Possibility to use with large samples
- Possibility to organize the results and interpretation of data.

To improve the validity of the results, the researcher decided to use both qualitative and quantitative approaches. Moreover, the interviews cannot answer all research questions, such as question no.5 which is "How effective are TQM principles when implemented among construction companies in Qatar?" Therefore, some information was obtained through questionnaire surveys. In light of two variables in this research which are TQM and Construction industry, the questionnaires designed to cover the elements of EFQM as in Figure (4.3), as a key area for introduction to TQM. The EFQM elements as follow:

- Leadership
- People management
- Policy & Strategy
- Resources
- Processes
- People Satisfaction
- Customer Satisfaction
- Impact on Society
- Business Results

Above elements were analyzed to examine the construction companies perception toward these elements, which would have an impact on TQM implementation in Qatar.

Figure (4.3): The EFQM Excellence Model



Source: Oakland, J, Marosszeky, M., (2006), Total Quality in the Construction Supply Chain, Butterworth Heinemann, UK

Most of the TQM principles are covered in the literature and the interviews questions. Also, the Questionnaires are based on the main principles of the TQM using the European Foundation Quality Management Model (EFQM) criteria as a data collection framework. According to Gemoets, (2009) says *"for the past twenty years we have shared what works between our member organisations as a way to help them implement their strategies: a mission which is as important as ever"* . To test these variables, the questionnaires were based on the comprehensive literature on critical issues related to the each variable. The response rate ranged from (5) strongly disagree to (1) strongly agree.

First: General Information

Tick (√) in box:

1- Your experience in construction industry:

- Less than 5 years □
- 5-10 years □
- 11-15 years □
- More than 15 years □

2- Your education

- Secondary school □
- Bachelor degree □
- Master degree □
- Phd □

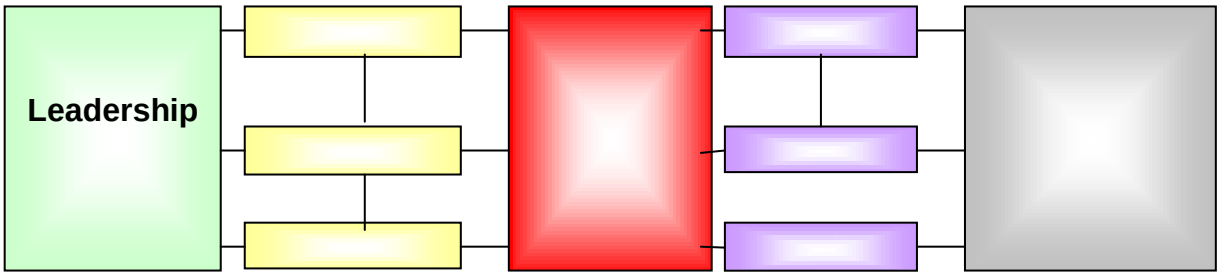
3- Number of training you participated in construction field

- One □
- Two □
- Three □
- More than three □

4.8 Questionnaire Variables:

According to European Foundation for Quality Management (EFQM, 1999-2003), the EFQM membership had grown from most European countries and most sectors of activity, Also, they described the criteria as the following:

4.8.1 Leadership



According to EFQM's vision, is to recognised leader in promoting and supporting the implementation of sustainable excellence. Since the leaders are those who develop and facilitate the achievement of the vision and mission of the organisation, the actions and behaviours of the leaders are reflected in the development of the values and systems that are required for sustainable success. The excellent leaders can change the direction of the organisation and inspire others to follow. Moreover, excellent leaders interact with customers, partners and the society as well. The literature identifies "leadership" as one of the critical success factors for sustaining continuous improvement in any organisation, (Zairi, 1994).

In order to attain "excellence" status, organisations should demonstrate that they are applying the principles of the model to the following four sub-criteria:

- Leaders develop the mission, vision & values and are role models of a culture of excellence
- Leaders are personally involved in ensuring that the organisation's management system is developed, implemented & continuously improved
- Leaders are involved with customers, partners & representatives of society
- Leaders motivate, support & recognise the organisation's people (EFQM 1999)

Many of quality experts highlighted the concept and role of the leadership as an important element of the total quality management processes. According to Zairi (2006), the importance of top management commitment and involvement is highlighted in the findings of several studies in USA and Europe. Also, Ramirez and Loney (1993) reported that management commitment was rated as the most critical step in quality improvement process activity. Oakland (2006) stated that the management must demonstrate their seriousness about quality. The chief executive of an organisation should accept the responsibility for and commitment to a quality policy in which he/ she must really believe.

Juran (1993) described that there are seven steps which a responsible CEO must take to achieve quality in any organisation:

- Set up and serve on the company's quality council.
- Establish corporate quality goals and make them a part of the business plan.
- Make provision for training the entire company hierarchy in managing for quality.
- Establish the means to measure quality results against quality goals.
- Review results against goals on a regular basis.
- Give recognition for superior quality performance.
- Revise the reward system to respond to the changes demanded by world class quality.

Hasan, et al. (2006) described that in a competitive and quickly changing business environment, the effective leadership becomes one of the most critical needs and requirements. In addition, it is argued in behavioural theories that leadership can be taught, and leaders can be made rather than born. According to McCarthy and Greatbanks (2006), Leadership is the first criterion of the European Foundation for Quality Management (EFQM) Excellence Model.

The participation in decision-making has a strong determinant of innovative behaviour. It also confirms the proposed link between a consulting leadership style and both idea generation and application behaviour. The leader of the successful team involved subordinates in decision making during weekly meetings, during which he and the team

worked together to set their priorities and goals. In contrast, the leader of the unsuccessful team never asked his workers' for input for decision making. (Jeroen and, Den Hartog, 2007).

Osseo, Longbottom and Murphy (2005), reported on "leadership-staff relationship" and suggest that it is important for leaders and their subordinate staff to understand the nature of the leadership-staff relationship, the critical success factors and associated best practices for sustaining quality improvement. Butler, (2007) carried out a study on the leadership in a multicultural Arab organisation and found that the quality of exchanges and relations between leaders and employees is related to the work experience of employees. Leadership should be top-down and emphasise charisma to win employees' admiration and increase satisfaction.

According to (Makower, 1993 in Zairi, 2007), leadership is a perquisite to all strategy and action planning. Curt (1991), identifies seven major characteristics of excellent leadership:

- Visible, committed, knowledgeable and dedicated to promoting quality and knowing relevant details and how well the company is doing.
- A missionary zeal in which leaders are trying to effect as much change as possible
- Aggressive targets, going beyond incremental improvements, and looking for large gains.
- Communication of value that effect cultural change related to quality.
- Flat organisational structures that allow more authority at lower levels.
- Senior management maintains strong customer contacts.

Also, Bell, et al. (2000) emphasised on the behaviour of all managers who are driving the organisation towards total quality. A total quality approach should demonstrate the involvement with customers and suppliers. According to Castilla, and Ruiz (2008), the management team has to be involved in the development of a culture of excellence. Oakland (2006) identified five requirements for effective leadership and are given here below:

- Developing and publishing clear documented corporate beliefs and purpose- a mission statement. The top management must then show total commitment to it.
- Develop clear and effective strategies and supporting plans for achieving the mission: the achievement of the company vision and mission requires the development of business strategy.
- Identify the critical success factors (CSFs) and critical processes: CSFs are what must be accomplished for the mission to be achieved. The CSFs are followed by the key; core business processes for the organisation.
- Review the management structure: Directors, managers, and other employees can be fully effective only if an effective structure based on process management exists.
- Empowerment- encouraging effective employee participation: for effective leadership it is necessary for management to get very close to the employees. They must develop effective communications- up, down and across the organisation- and take action on what is communicated; and they should encourage good communications between all suppliers and customers.

Moreover, improving the quality of communication and decision-making exchanges between leaders and employees can improve the efficiency and productivity of the organisation. The exchange of communication and decision-making between leaders and employees varies depending on the leadership style.

To test the leadership as a variable for this questionnaire, the main principles of leadership were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Participate with the employees in decision-making.

   As 1 2 3 4 5 Ds

2. Management structure based on effective process management exists.

   As 1 2 3 4 5 Ds

3. Provide a proper system for employees to increase productivity.

   As 1 2 3 4 5 Ds

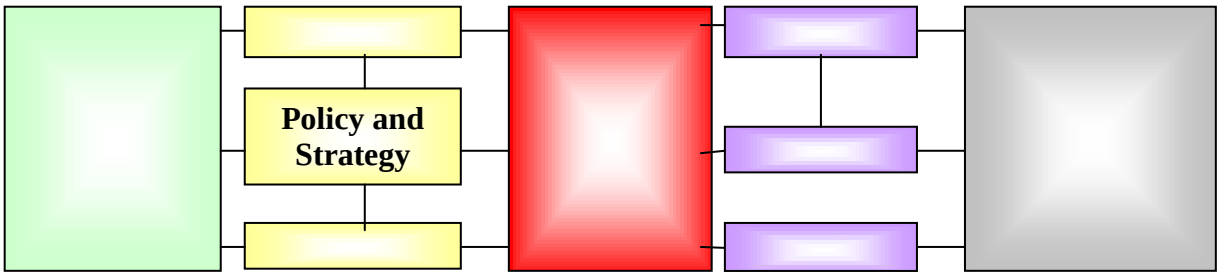
4. Working to continuously develop and improve the company processes

   As 1 2 3 4 5 Ds

5. Our management encourages communications with suppliers and customers.

   As 1 2 3 4 5 Ds

4.8.2 Policy and Strategy



The implementation of the vision and mission by developing a stakeholder focused strategy that takes account of the market and sector in which it operates are the criteria of excellent organisation. Oakland (2006), the criterion policy and strategy is concerned with: how the organisation implement its mission and vision via a clear stakeholder-focused strategy, supported by relevant policies, plans, objectives, targets and processes. Few construction organisations would consider that their supply chain is a stakeholder in their organisation, and very important part of a construction organisation's strategy must consider such issues as the values, skills, knowledge and attitudes of subcontractor management and employees.

According to Zairi (1999), one of the best methods to access the effectiveness of policy and strategy is to use criteria of excellence from prestigious quality models such as the Malcolm Baldrige National Quality Award (MBNQA) and the European Quality Award (EQA). Bell, et al. (2000), the organisation's mission, values, vision and strategic direction and the ways in which the organisation achieves them:

- How policy and strategy are formed on the basis of information that is relevant to total quality.
- How policy and strategy are based on the concept of total quality
- How policy and strategy are the basis of business plans
- How policy and strategy are communicated and implemented.
- How policy and strategy are regularly updated and improved.

Castilla and Ruiz (2008), state policy and strategy in excellent organisations must be based on the knowledge of key agents' expectations and needs. The information gathered

from stakeholders should be complemented with other additional sources of information and with performance indicators.

Olian, and Rynes (1991), clearly showed that successfully implementing TQM in any organisation requires the alignment of every member's efforts with the aim of the organisation. Thiagarajan and Zairi (1997), quality policy provides the context and launching platform for the implementation of TQM. Typically the quality strategy, goals, vision/mission and values are contained within the larger quality policy. Zairi (1994), in a study of strategy development and implementation found that 73 per cent of managers believed that implementation is more difficult than development.

The development of polices and strategies requires a detailed review of the major stakeholders' needs, the performance of the competitors, the market/ industry/sector conditions to form the basis of top level goals, planning activities and sitting of objectives and targets. (Oakland, 2006). According to Lee and Dale (1998), Policy deployment works on two levels to manage continuous improvement and achieve business results: strategic objectives and daily control of the business. (Duarte, 1993 in Lee and Dale, 1998) presents a four-step policy deployment process:

- Prepare the organisation to create policies that will change the way it does business,
- Create the plan, using input from key customers and managers from the organisation's key activities,
- Deploy the policies through a schedule of regular updates and follow up and by committing resources to ensure accomplishment of the goals and objectives.
- Revisit the first three steps during the annual review to ensure continuous improvement of the process.

These simple steps belie the complexity of the real process, and fail to emphasise that the daily control of activities is the foundation of policy deployment, pinpointing performance strengths and weaknesses, (Zairi, 2006). The principles of policy deployment can be summarised as focus on processes, not results; founded on daily control; goals based on customer needs; through analysis of previous stage; top-down, bottom-up planning; objectives aligned throughout the organisation to achieve common goals; widespread understanding of TQM; means deployed with targets; regular review

mechanism, focus on corrective action; and dynamic, flexible, never-ending improvement. (Lee and Dale, 1998).

To test the policy and strategy as a variable for this questionnaire, the main principles of policy and strategy were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1- The concept of total quality is reflected in the Company's values, vision, and mission.

As 1 2 3 4 5 Ds

2- The company policy and strategy are managed and reviewed on a regular basis.

As 1 2 3 4 5 Ds

3- Necessary resources available for achieving the company's policy and strategy

As 1 2 3 4 5 Ds

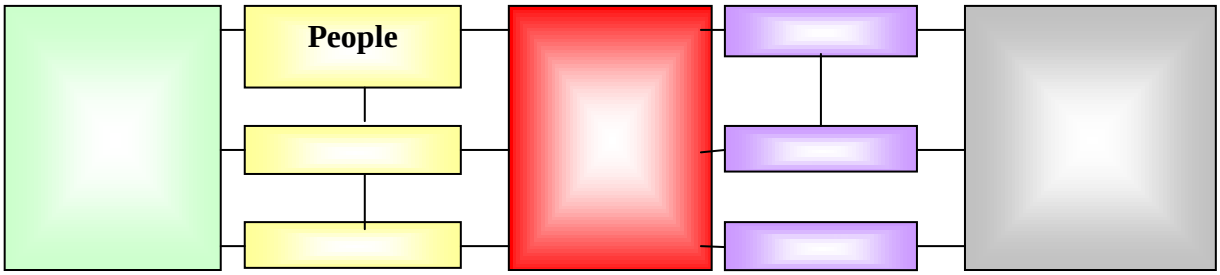
4- Company policy and strategy can be modified according to business results.

As 1 2 3 4 5 Ds

5- The concept of total quality is embraced in the company's strategy.

As 1 2 3 4 5 Ds

4.8.3 People



Excellent organisations mange, develop and release the full potential of their people as an individual, team- based and organisational level. Also, people are involved and empowered in all organisation activities with the transparency dialogue between them.

According to Bell, et al. (2000), the management of the organisation's people, how the skills and capabilities of the people are preserved and developed through recruitment, training and career progression:

- How people and teams agree targets and continuously review performance
- How the involvement of everyone in continuous improvement is promoted and people are empowered to take appropriate action.

According to Gatchalian (1997), all employees must participate in the development of shared vision, mission, plans and in quests for continuous improvement, also McCarthy (2005), stated in some organisations in UK all employees participated in the development of the mission and values. Elsewhere, employees or groups of employees had the opportunity to comment on mission and values before they were finalised, while in other organisations, leaders developed the mission and values and communicated them to employees. (Gufreda and Maynard, 1992 in Adebanjo and Kehoe, 1998) described employee involvement as the process of transforming an organisation's culture to utilise the creative energies of all employees for problem solving and for making improvements. Employees in such positions should therefore have the skills to respond effectively and efficiently to customer needs. (Hansemark and Albinsson, 2004).

According to Jackson (1999), the UK Government believes that effective involvement of people is fundamental to the controls assurance process. With regard to the EFQM

excellence model, the enablers for the sub-criteria “people” are: how people resources are planned, managed, and improved; how people's knowledge and competencies are identified, developed and sustained, how people are involved and empowered; how people and the organisation have a dialogue and how people are rewarded, recognised and cared for (EFQM, 1999). According to Thiagarajan and Zairi (2006), rewards and recognition is one of the enablers which maximises employees’ potential and involvement and in doing so, becomes one of the main contributors to the company’s journey to quality. Similarly, there has been work that links employee rewards and recognition to productivity performance. (Xu, et al., 2006).

Castilla and Ruiz (2008), state that the organisation that seeks excellence must be concerned with the welfare of people. Ethical values are strictly necessary in human capital managements. That also means a labour climate based on transparency, integrity, mutual confidence and participation. People must be involved in training. In a convenient work environment, with an optimal work conditions, the development of people skills will increase their capacities and qualification.

Ishikawa (1985), “quality begins and ends with training”. Zairi (2006), top management of best organisations, recognising the link between education and successful TQM, also focus their implementation process around it. Investment in training is at a high level for companies integrating or linking business results and people management. Moreover, he summarized some of the quality gurus' views regarding the importance of training such as Crosby (1989), Juran (1974) and Feigenbaum (1961) emphasised the need for organisation-wide education and quality awareness programmes. Kano (1993), stresses the importance of adapting training programmes to the company’s workplace.

According to Asif et al. (2009), top companies in the USA have come together to form a co-operative venture to identify training’s best practice and generate comparative data to set a standard for their individual efforts. Moreover, Kimmerling and George (1993) stated that, the American Society for training and development’s benchmarking forum is represented by 37 companies. One of their motives is a desire to learn how to adopt training practices that clearly provide a competitive advantage.

Teams are a management tool and are most effective when team activity is clearly linked to organisational strategy. Oakland (2006), on construction projects processes and problems that cross organisational boundaries can be effectively dealt with by inter-organisational teams. According to Zairi (2006), teams should be the basic unit of performance for most organisations because they represent a combination of multiple skill, experiences and judgements. According to Thiagarajan (1997), Successful organisations are run with teams- for solving problems, for improving quality, for introducing new processes and products. According to Castka, et al. (2003), they discuss teamwork, development of a team-based organisation and performance measurement issues. This discussion leads to the formulation of the (TEAM) model. The model is therefore divided into three main categories:

- Organisational enablers: represent the organisational dimension in teamwork development; the criteria used for measurement are former EFQM criteria modified for teamwork; describes how results in terms of teamwork culture development are achieved.
- Team enablers: a new "box" in the model; are based on seven factors for successful implementation of high performance teams as the following: organisational impact, defined focus, alignment and interaction with external entities, measures of performance, knowledge and skills, need of the individual, group culture describes how results within a team are achieved.
- Team results: identical description as in the EFQM; describes what the team has achieved and is achieving.

To test the people management as a variable for this questionnaire, the main principles of people management were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Employees participated in the development of the company's vision

   As 1 2 3 4 5 Ds

2. The use of surveys to obtain perceptions of employees

   As 1 2 3 4 5 Ds

3. Training are implemented according to employees requirements

   As 1 2 3 4 5 Ds

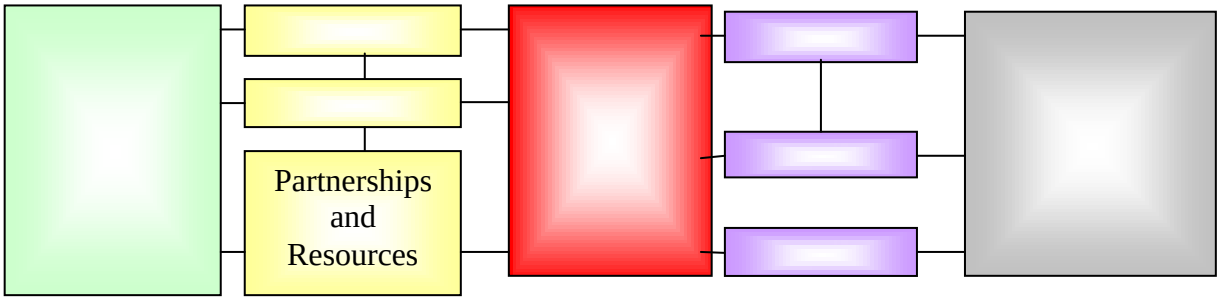
4. Proper rewards system apply to employees

   As 1 2 3 4 5 Ds

5. The quality improvement teams are effective

   As 1 2 3 4 5 Ds

4.8.4 Partnerships and Resources



Excellent organisations plan and manage external partnerships, suppliers and internal resources such as buildings, equipment, technology and materials in order to support policy and strategy and the effective operation of processes.

The sub-criteria for the partnerships and resources element of the EFQM excellence model are:

- External partnerships are managed
- Finances are managed
- Buildings, equipment & materials are managed
- Technology is managed
- Information & knowledge are managed

In construction where much of the work is outsourced, the construction companies are increasingly finding that their risks, whether they are safety, quality, production or environment related, lie in the hands of their subcontractors' employees and supervisors. Oakland and Marosszeky (2006) summarized the requirements for establishing partnerships such as:

- Understanding of what is to be delivered by the partnership.
- Getting the commercial relationship right.
- Working in a supportive team- based relationship.
- Having solid programmes of work, key milestones and decision points.
- Implementing joint training programmes between the partners
- Developing the working relationship based on continuous improvement principles.

All organisations provide resources to support the effective operation of the processes that hopefully will deliver the strategy. Bell, et al. (2000), the resources come in many forms such as financial resources, information resources, material resources, and technology resources. Oakland and Marosszeky (2006), state that investment is the key for the future development and growth of business. Compared to other business sectors, in construction it is more difficult to assess the benefits of investing in change and improvement strategies. This is due to each project being different with a different production team makes it difficult to compare one to the other. To overcoming this resistance is to assess the cost of current inefficiencies.

According to Theodorakioglou, et al. (2006), the results from the TQM perspective; that the TQM category "partnerships/resources" was proved to have the mostly significant correlation with all supplier management categories, except from the supplier policy. It therefore seems that a firm should pay particular attention to the identification of its key partners and strategic partnership opportunities, which are in line with its policy and strategy and have compatible cultures. The firm must seek to exploit and harness technology to support improvement.

Mann, et al. (1999), listed the examples of best practice in resource management are shown below:

- Post-investment evaluations undertaken to monitor the effect on the cost base and output, and to ensure that pre-investment expectations are attained.
- Use of activity-based costing.
- Systems to identify and review continually the information needs of the company/employees and present it in a format that is easily understandable.
- Individuals responsible for the security and effective utilisation of fixed assets.
- Individuals responsible for managing and controlling other resources such as materials, in-process, final goods and consumables (gas, water, etc.).
- Regularly planning for, introducing and monitoring the effects of new techniques.

Cornford (2001) argues that resource management can be analysed in two sections:

Communication management and supplier management, he suggests that local resources are important in the day-to-day work of people in higher education. Also, according to (Kanji and Asher, 1993 in Thiagarajan, Zairi, 1997) best organisations recognise that communication could make the difference between success and failure. And they add the need for effective communication for the development of awareness of, and commitment to, quality in an organisation's environment: *"communication is part of the cement that holds together the bricks of total quality process supporting the principle of people-based management."* Baidoun, (2003).

To test the partnerships and resources as a variable for this questionnaire, the main principles of partnerships and resources were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. The company resources are sufficient to implement Total Quality Management.

   As 1 2 3 4 5 Ds

2. Company management recognizes that effective communication is the key towards creating a quality environment within the departments.

   As 1 2 3 4 5 Ds

3. Resources deployed in the development of company activities.

   As 1 2 3 4 5 Ds

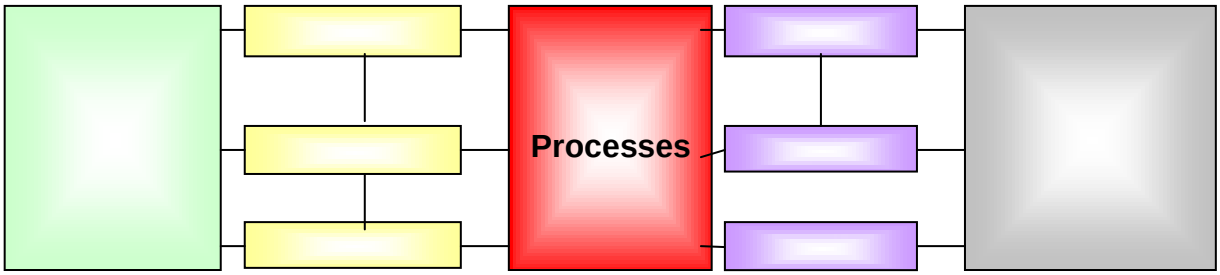
4. The company and its partners work together for the same goals.

   As 1 2 3 4 5 Ds

5. The company uses an appropriate system for managing financial resources.

   As 1 2 3 4 5 Ds

4.8.5. Processes



Excellent organisations are systematically design, mange and improve processes in order to satisfy and increase value of their customers and stakeholders. The improvement also, including the development of their products, services and customer relationship.

According to (EFQM, 1999), the sub-criteria for the processes elements of the model are:

- How processes are systematically designed and managed.
- How processes are improved as needed, using innovation in order to fully satisfy and generate increasing value for customers and other stakeholders.
- How products and services are designed and developed based on customer needs and expectations.
- How products and services are produced, delivered and serviced; and how customer relationships are managed and enhanced.

According to Bell, et al. (2000), a process is all the internal operations and sequences of operations used to generate and deliver a products or service. These can include design, competitive analysis, scheduling, planning, engineering, production, accounts payable. They add the management of processes is based on the knowledge of customer requirements and of their expectations, and the expertise to analyse the processes for improvement opportunities as well as to implement improvements in the process. The processes must be focussed on the satisfaction of internal and external customer needs and expectations. Processes, aligned with strategy, mission and objectives, have to add value to customers and other stakeholders. (Castilla and Ruiz, 2008).

According to Mele and Colurcio (2005), innovation management requires enterprises to master mechanisms and tools suitable for creating, fostering and diffusing knowledge

generating customer value, and they argue that, in some enterprises the management for processes constitutes a way to work already tested and part of the routine and it is identified with TQM, for example (ABB) in 1998 started a project called "Simplified process", with the aim to achieve better performances and to develop an organisational asset coherent with quality and competitiveness objectives. In the context of the project a single macro-process has been individuated. It is articulated in precise phases: offers, agreements, order and order development, fabrication, external operation. In the different phases four main processes have been individuated: customer process; production process; external operation process; management process.

Oakland (2006), in research on award- winning companies identified process management best practice as:

- Identifying the key business processes: prioritizing on the basis of the value chain, customer needs and strategic significance, and using process models and definitions.
- Managing processes systematically: giving process ownership to the most appropriate individual or group and resolving process interface issues through meetings or ownership models.
- Reviewing processes and setting improvement targets: empowering processes owners to set targets and collect data from internal and external customers.
- Using innovation and creativity to improve processes: adopting self- managed teams, business process improvement and idea schemes.
- Changing processes and evaluating the benefits: through process improvement or re-engineering teams, project management and involving customers, and suppliers.

Zairi (2006), argue that the success of the quality improvement process depends on effective and systematic implementation. Given the corporate–wide nature of TQM, a suitable infrastructure to support quality initiatives is required. According to Dale (1996), if an improvement process is to progress in a continuous and incremental manner it is necessary to evaluate it at regular intervals in order to identify the next steps, what else needs to be done, what has worked well and the reasons for this and what has been unsuccessful, focus people's efforts, highlight issues and problems and areas of concern or weakness which need to be addressed, and to recognize improvement opportunities.

Oakland (2003) emphases on the authority must be given to those charged with following TQM through with actions that they consider necessary to achieve the goals. The commitment will be continually questioned, and will be weakened and destroyed by failure to delegate authoritatively.

Colin Armistead (1996) summarized some principles of managing by process such as: Know the process, understand the linkages, work on the trade-offs, teach others about the process, train within the process, measure the process, manage careers, build specialist expertise, improve the process.

To test the processes as a variable for this questionnaire, the main principles of processes were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. The company processes are systematically managed and improved regularly.

   As 1 2 3 4 5 Ds

2. The company process performance is measured, and customer feedback considered.

   As 1 2 3 4 5 Ds

3. The company encourages innovation and creativity in process performance improvement.

   As 1 2 3 4 5 Ds

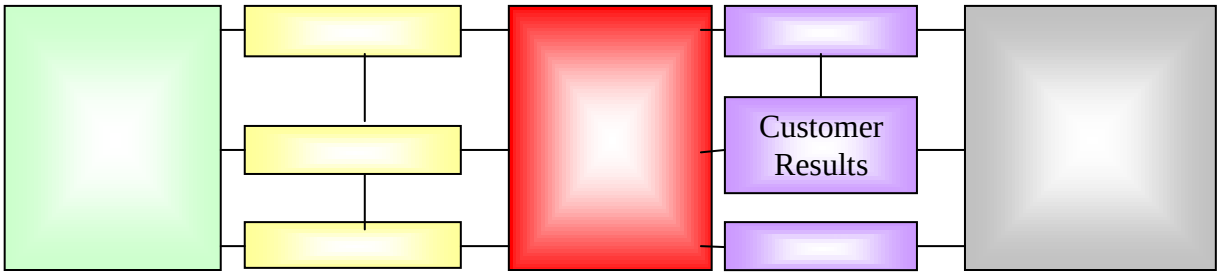
4. The company processes are designed and developed based on customer needs and expectations.

   As 1 2 3 4 5 Ds

5. The company is focusing on the processes more than the end results

   As 1 2 3 4 5 Ds

4.8.6- Customer Results



Excellent organisations comprehensively measure and achieve outstanding results with respect to their customers. Self-assessment implies a comprehensive and regular review of an organisation's activities and results against the criteria of the model.

According to (EFQM, 2006), the sub-criteria for the customer results: perception measures are of the customers' perceptions of the organisation by customer surveys, focus groups, compliments and external resources rating. The examples of measures depending on the purpose of the company and may include the perception of the company's end user:

- Impact on the company's image due to the company's relationship with a specific external resource, due to the reputation of the company in terms of values and ethics on the management of its network of external resources and due to values, ethics and public responsibilities of its network of external resources of the company.

- Impact on the company's product and services delivered directly by the company's network of external resources, like the delivery performance of the company's logistics partner, or customer's quality perception due to external parts and services included in the company final product or service.

The performance indicator's measures are the internal ones used by the company owing to monitor, predict and improve the performance of the company and to predict perceptions of its external customers. The performance measured concerning the final customer (end user) of the company:

- Impact on the company's image such as press releases, number of "boycotts" for the company products and sales volume changes.
- Impact on the company's products and services, such as non conformity claims from customers, penalties paid to customers and sales increase subsequent to introduction of a new external resource

McAdam and Bannister, (2001) argued that Western companies are driven by profit, whereas in companies with TQM processes in place, profits come from customer satisfaction. According to Moullin (2004), in measuring performance it is important to have a balance between perception measures, which are obtained directly from service users and other stakeholders, and performance indicators, which are recorded directly by the organisation.

Employees in such position should have the skills to respond effectively and efficiently to customer needs, Potter-Brotman, (1994). Customer survey is the method most commonly used to track customer satisfaction, Oakland and Beardmore (1995). Satisfaction is an "overall customer attitude towards a service provider, Terrence and McDougall, (1996). High consumer satisfaction leads to greater customer loyalty, (Yi, Y., 1990 in Gilbert and Veloutsou, 2006). According to Zairi (1994), measuring customer satisfaction is a cornerstone of TQM, and many best organisations have adopted the technique of Quality Function Deployment (QFD) to bring the voice of the customer into everything they do.

According to the EFQM model, results concerning customers can be measured using indicators or assessing their perception. Different aspects must be considered as in Figure (4.4):

- Customer perception about products and services. The degree of satisfaction should be measured.
- Reliability of products and services (quality warranty). Level of transparency and honesty.
- Perception of the social impact (derived from organisational activity).
- Organisational reputation.
- Level of optimisation of owners' and investors' goods compatible with the mission, vision, and values integrated in the system of ethics management.

- Interests balance. Impartiality in profit distribution.
- Fluent communication with shareholders and stakeholders. Information has to be transparent and truthful. (Castilla, Ruiz 2006)

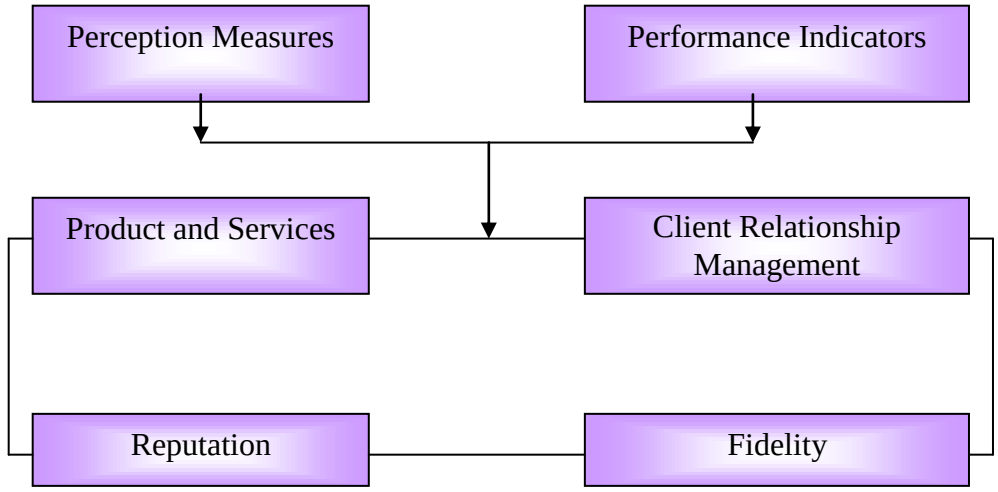


Figure (4.4): Structure of "Customer results"

According to Chien, et al. (2003), many scholars have discovered that there is a positive and significant relationship between customer satisfaction and long term financial performance of companies. Therefore most countries include customer satisfaction as an important judgment criterion for national quality award in a quality promotion policy. Therefore customer satisfaction should play a central role in the company's TQM, and it will also be one of the most important strategies and issues for the corporation in the future. Hansemark and Albinsson (2004), in a study to explore how the employees of a company experience the concepts of customer satisfaction and retention, found seven ways to define and recognise or enhance satisfaction. These were service, feeling, chemistry, relationship and confidence, dialogue, complaints and retention.

According to Gilbert and Veloutsou (2006), the most widely employed models used for cross industry analysis are the American and the European Customer Satisfaction Indexes (ACSI and ECSI). Claes Fornell et al. (1996), emphasis on the importance of adopting such index to analyse the customer satisfaction level. The importance of customer satisfaction is recognized. As a result, each country has provided its own National Customer Satisfaction Index (NCSI) to analyse the level of customers through the companies' efforts. The results could be used in performing a competitive advantage comparison between industries and companies, as well as important referential indices

when developing company strategy Chien, et al. (2003), the aim of NCSI is to gain a deeper insight into the interaction between customer and the supplier.

To test the Customer Results as a variable for this questionnaire, the main principles of Customer Results were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Customer perceptions in our company are measured by customer surveys, focus groups, compliments and complaints

   As 1 2 3 4 5 Ds

2. The company adopted an internal performance indicator to monitor, predict and improve customer perception.

   As 1 2 3 4 5 Ds

3. The company provides shareholders with truthful information in full transparency

   As 1 2 3 4 5 Ds

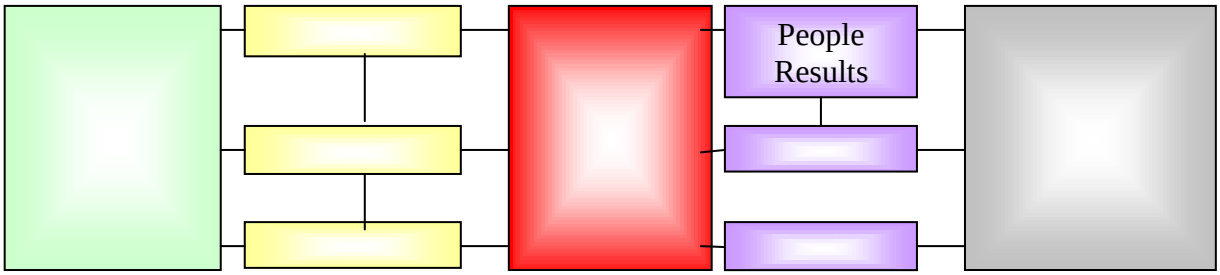
4. The most important strategy in our company the achievement of customer satisfaction

   As 1 2 3 4 5 Ds

5. The customer service in the company is effective

   As 1 2 3 4 5 Ds

4.8.7 People Results



Excellent organisations comprehensively measure and achieve outstanding results with respect to their people.

According to (EFQM, 2006), the sub-criteria for the people results elements of the model are:

- Perception measures
- Performance indicators

Perception measures are of the people's perception of the organisation managing the network of external resources. (Obtained, for example, from surveys, focus groups, interviews, structured appraisals). Performance indicators, these measures are the internal ones used by the organisation in order to monitor, understand, predict and improve the performance of the organisation's people and to predict their perceptions.

According to Juan and Oscar (2008), a people result is an intellectual capital perspective as in Figure (4.5). This criterion fits adequately with human capital elements (results concerning values, attitudes, aptitudes and capacities). There is no doubt that the basic productive resource nowadays is knowledge. Therefore, talent is the most relevant characteristic of the knowledge worker. People results will be measured using indicators or by assessing perception. They also evaluated different aspects of people results:

- People's motivation with regard to the development of professional careers, communication, equal opportunities, involvement leadership, learning opportunities, recognition, definition of objectives, performance evaluation, values, mission, politics and strategy, training, and promotion in the organisation.

- People's satisfaction with regard to management, employment conditions, installation and services, health and safety conditions, salary, wages and benefits, relation between peers, change management, policy and environmental impact, organisational role in the community, and work environment.
- People's motivation and involvement with team work, training and development of professional careers.
- People's satisfaction measurement, i.e. absenteeism index, accident index, complaints, people turnover, labour disputes, use of health, social and cultural benefits, and use of the organisation's installations (nursery school, etc.).

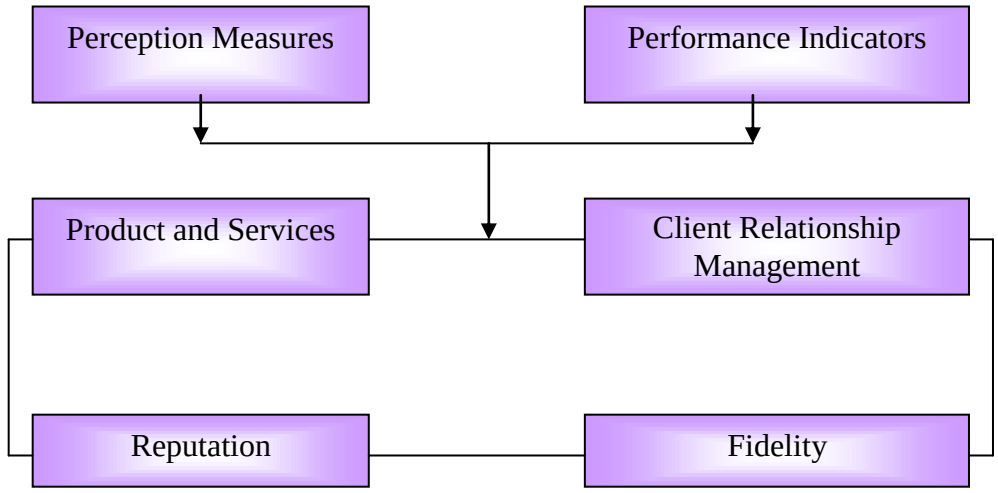


Figure (4.5): Structure of "People results"

To test the People results as a variable for this questionnaire, the main principles of People results were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Employees' perceptions of our company are measured by customer surveys, focus groups, compliments and complaints

   As 1 2 3 4 5 Ds

2. Our company motivates its employees by providing learning opportunities for them all.

   As 1 2 3 4 5 Ds

3. Our company motivates its employees by providing training for all.

   As 1 2 3 4 5 Ds

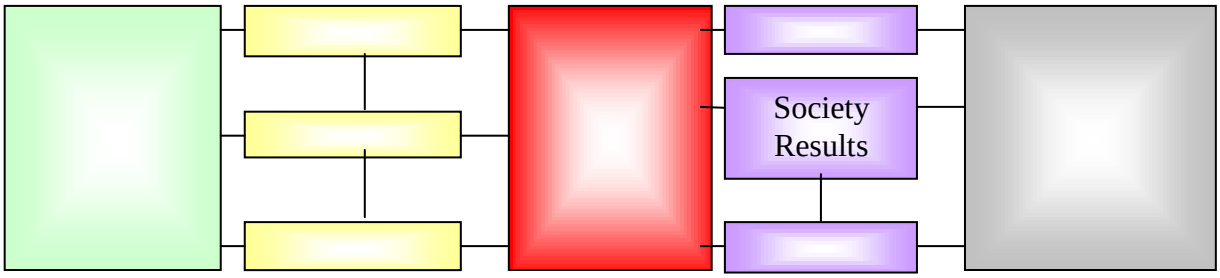
4. Employees in our company are satisfied as far as health and safety are concerned

   As 1 2 3 4 5 Ds

5. Employees in our company are satisfied regarding their salary and wages

   As 1 2 3 4 5 Ds

4.8.8 Society Results



Excellent organisations comprehensively measure and achieve outstanding results with respect to their Society. According to (EFQM, 2004), the sub-criteria for the Society results elements of the model are:

- Perception measures
- Performance indicators

Perception measures are of the society perception of the social, environment and economic performance of the organisation and the products and services it produces compared to the general values, needs and expectations of society.

According to Avlonas, et al. (2004), organisations in the private sector survived historically by generating maximum profits for their shareholders. Today this approach is simply not enough to guarantee survival. In the modern world, organisations of every size and in every market have to earn and retain to consent of society at large to stay in business.

According to Castilla and Ruiz (2006), this is a key criterion that should not be forgotten. As well as the economic benefit, organisations have a set of socially indispensable objectives.

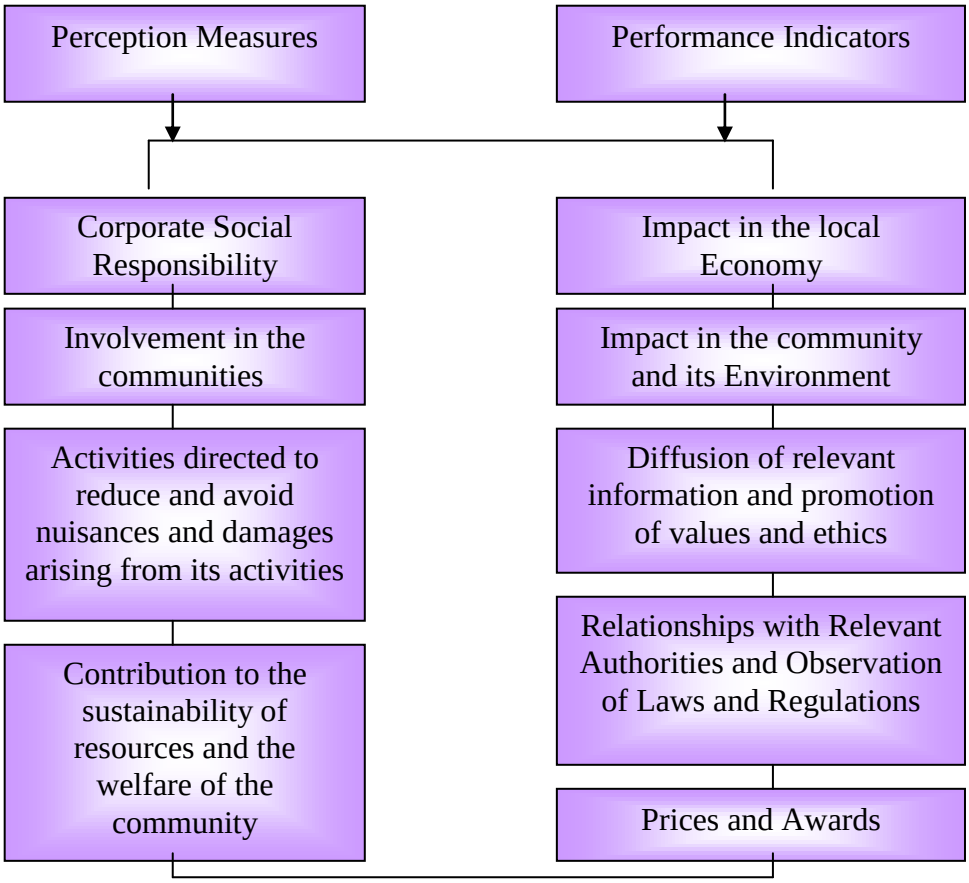


Figure (4.6): Structure of Results in Society

According to Castilla and Ruiz (2006) Figure (4.6) shows the organisations play an eminent role in the sustainability of the market, which is overall a social institution. This is the foundation of the corporate social responsibility approach, and is possible to point to some areas:

1. Active participation of the organisation in social activities:

- Ethical behaviour and spread of values in society.
- Disseminating relevant information for the community.
- Development of a policy of equal opportunities.
- Wealth creation and its impact on the local and national economy.
- Relations with relevant authorities – observation of the rules.
- Openness and understanding with different social agents.

- Impact of the organisation's publicity on social values.

2. Organisation's involvement with the community:

- Involvement in social and economic development – social cohesion through
- Collaboration with public administration and third sector organisations
- Involvement in education and training of community members
- Support for cultural and social activities
- Voluntary work and philanthropy.

3. Organisational activities oriented towards the removal of the damage derived from its activities and the life-cycle of products and services.

4. Information about organisational activities oriented to preserve resources (resource sustainability). Activities for promoting good practice both in the organisation and in society must also be considered.

5. Spreading of the results of organisation's evaluations in several areas (environment, ethics, risk at work, quality)

6. Social involvement of the organisation and corporate reputation. It is easy to note that this is a criterion directly related to social capital. However, it also includes relations with quality institutions (business capital).

To test the Society Results as a variable for this questionnaire, the main principles of Society Results were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Our company actively participates in social activities

   As 1 2 3 4 5 Ds

2. Our company is involved in the training and education of community members

   As 1 2 3 4 5 Ds

3. The company's evaluations of quality results are spreading to society

   As 1 2 3 4 5 Ds

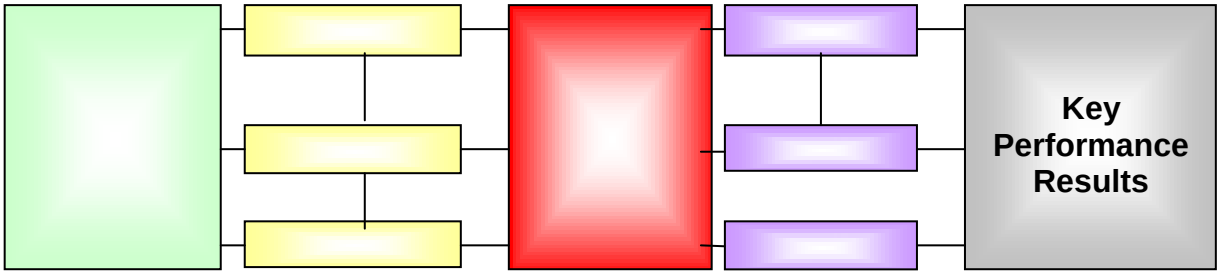
4. Our company seeks to build good relations with quality institutions

   As 1 2 3 4 5 Ds

5. The society decides the continuity of our company in business

   As 1 2 3 4 5 Ds

4.8.9. Key Performance Results



Organisations which are excellent in managing their external resources comprehensively measure and achieve outstanding results with respect to their business performance. According to (EFQM, 1999), the sub-criteria for the Key Performance Results elements of the model are:

- Key Performance Outcomes
- Key Performance Indicators

Key performance outcomes cover the financial and non-financial results. The financial results include the margin improvement, total cost of ownership, cash availability and working capital, sales increase, investment and asset related results. While non-financial results include market share, shorter time to market, shorter cycle time, increased rate of innovation, and higher customer satisfaction. Also, the key performance indicators measure the operational ones used in order to monitor and understand the processes and predict and improve the organisation's likely key performance outcomes. Depending on the purpose of the organisation examples of measures that may be made include: Financial indicators such as cost of goods sold, inventory levels and turnover speed of capital employed, operational, maintenance, transport cost, (warranty, waste, non-quality, rework), sales volume due to joint development with external resources. While, non-financial indicators such as number of accidents across the network of external resources, number of long term agreements, production capacity on short, mid and long term, and delivery reliability. (EFQM, 2006).

McAdam and Bannister (2001) discuss the need for performance measurement within TQM frameworks. Furthermore, it is argued that the measures must include hard and soft measures and that both management and employee perceptive measures should also be

used. They found most of the literature indicates that TQM should be incorporated with a hard and soft measuring framework. There has to be a need to measure internally for establishing a standard of effectiveness reflecting the organisation's strengths and an external standard which reflects ability to compete. Attributes which indicate an effective performance measurement system include:

- Activities are streamlined
- Processes are well understood and simplified
- Everything is important
- Everyone adds value to the end customer
- Measurements should reflect progress visibility and problem elimination
- Measurement is relative, not absolute and is everyone's responsibility

From the above listed attributes it becomes apparent that there is a need to change emphasis in measuring performance from manager centred to a customer centred approach.

Mann, et al. (1999), listed some examples of best practice in business results:

- Use of a range of financial and non-financial measures to measure business success. Generally, these measures are compared not only with past performance but also with similar measures in other companies.

- Financial targets are typically set on an annual basis, with a trend to improve over a number of years. The more common financial measures in use are profit growth, return on capital employed, net profit before tax, and growth in market share and share prices. Some are considering the use of value-adding indicators such as Economic Value Added (EVA) and Market Value Added (MVA) (for more information on these indicators refers to (Ashton, 1997 in Mann, et al., 1999).

- Non-financial targets tend to focus on the needs of all stakeholders, including shareholders, employees, customers, suppliers and the community.

- Benchmarking performance at all levels of the organisation. Benchmarking enables companies to set competitive performance targets, identify performance gaps, and identify and implement best practice approaches, and then provides a method for re-assessing the performance gap.

Oakland (2006), state that before use performance measurement in the improvement cycle, four basic questions need to be answered: Why-What-Were and How to measure? The need for measurement for the following reasons:

- To ensure customer requirements have been met.
- To be able to set sensible objective and comply with them
- To provide visibility and provide a "scoreboard" for people to monitor their own performance levels.
- To highlight quality problems and determine which areas require priority attention.
- To give an indication of the costs of poor quality.
- To justify the use of resources.
- To provide feedback for driving the improvement effort.

According to Castilla and Ruiz (2006), the benefits of knowledge management should ultimately be demonstrated in the key performance indicators of the company or organisation. The EFQM considers the following aspects:

1. Financial and economical results that maximize investors' value with sustainability.

2. Non-economic results that improve the organisation's position and reputation.

3. Optimal and sustainable management of the following elements (the management should be aligned with mission, vision, values and strategic objectives):

- Processes;
- External resources including alliances;
- Economy and finance;
- Material goods;

- Technology; and
- Information and knowledge.

In this case, aspects concerning intangible capital are placed in structural capital and relational capital. In general terms, knowledge management will provide knowledgeable information to employees in order for them to make decisions that will promote a continuous and consistent improvement in quality. Figure (4.7).

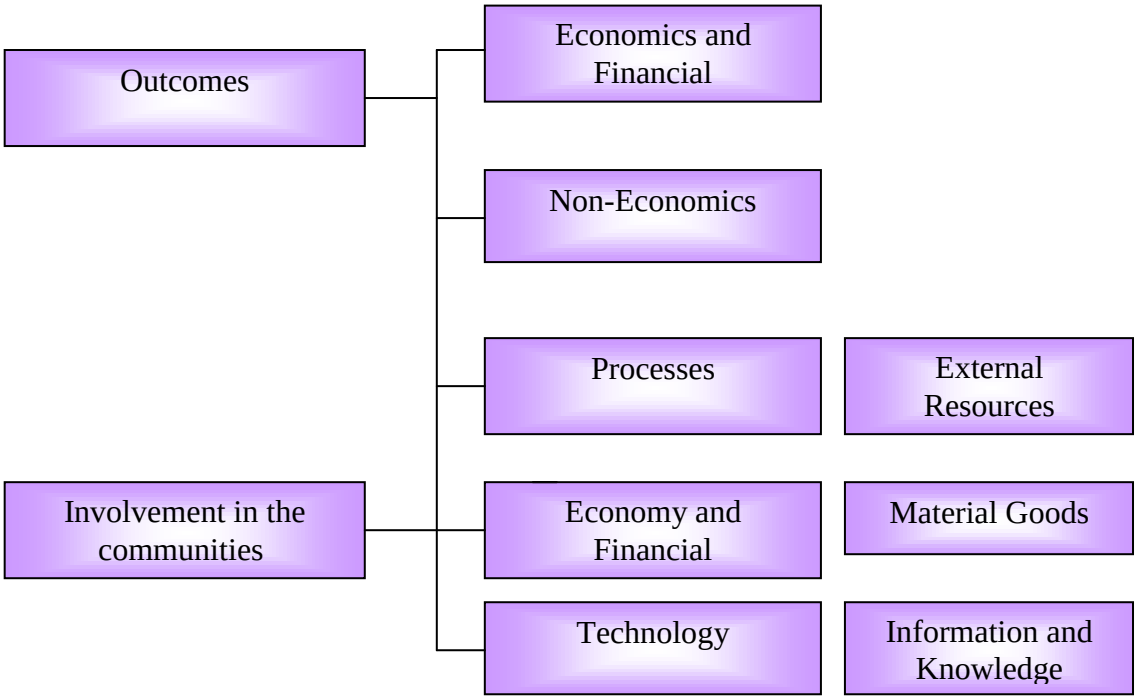


Figure (4.7): Structure of Key Results

To test the key performance results as a variable for this questionnaire, the main principles of key performance results were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. The proper system exists to measuring key performance results (KPRs)

   As 1 2 3 4 5 Ds

2. Key performance results (KPRs) in our company do cover the financial and non-financial results.

   As 1 2 3 4 5 Ds

3. The main goal of measurement in our company is to ensure that customer requirements have been met.

   As 1 2 3 4 5 Ds

4. Knowledge management is the main component in the company (KPRs)

   As 1 2 3 4 5 Ds

5. The company trend is to review and improve the key results regularly.

   As 1 2 3 4 5 Ds

4.9 Continuous Improvement and Cultures

From literature, the term of "continuous improvement" and "Culture" both have a critical impact in successful implementation of TQM. Therefore combining these two concepts in our framework as variables is vital. Gatchalian (1997) stated that the TQM is a philosophy which emphasizes that continuous improvement is a process with customer satisfaction as its ultimate goal.

4.9.1 Continuous Improvement:

The concept of continuous improvement basically distinguishes "TQM" philosophy from other quality philosophy such as "ISO" system because the continuous improvement is not necessarily in their standards. Boer and Gertsen (2003) defined the continuous improvement (CI), as "the planned, organized and systematic process of ongoing, incremental and company-wide change of existing practices aimed at improving company performance". According to Chin and Pun (2002), organisations are seeking every opportunity to improve their business results. Attaining continuous performance improvement and business excellence is the common goal that ties with the concepts of TQM. Marin-Garcia, et al., (2008) points out that, many authors have considered continuous improvement as one of the basic tools for implanting systems of production based on total quality management.

According to Frances, et al. (2003) stated that, the successful implementation of kaizen in Japan during more than 40 years has led to the expectation that continuous improvement (CI) might offer companies a means to gain and maintain a competitive advantage in the turbulent 1980s and 1990s. They demonstrate that the results of the self-assessment itself may reflect only symptoms of the barriers to continuous improvement implementation. For instance, lack of cross-functional cooperation was not per se a barrier to continuous improvement implementation but the lack of functioning enablers to support relevant behavioural routines did serve as barriers for this group.

According to Oakland (2006), within the construction industry there is a perception that as the industry deals with one-of-kind production; numerical processes are either of very

limited or of no value. They have been developed by manufacturing and therefore have very limited application in construction. The challenge for every senior manager in a construction industry organisation is to discover how he/she can use management tools and techniques to improve his/her processes. According to Antony, et al. (2000), continuous improvement of product, process and service quality is important for today's organisations to remain competitive in global marketplaces. Statistical process control (SPC) is an important and powerful technique for the continuous improvement of product and process quality.

According to Peter and Ross (2003), continuous improvement is often viewed as a key component of TQM, the process of implementing TQM in an organisation often creates a linkage between the more mechanistic and technical activities of quality control, and effective continuous quality improvement. Also, according to Samat, et al. (2006), continuous improvement can be enhanced through ongoing assessment and feedback. The commitment of top management is the key issue for any quality system as mentioned in study about continuous improvement framework implications for academia. Temponi (2005) concluded that the adoption of a continuous improvement approach in higher education requires not only upper administration commitment, but also uncovering the current underlying culture and examining the appropriateness of the objectives to adopt continuous improvement.

Bhuiyan and Baghel, (2005) indicated that continuous improvement can take place at three different levels within the organisation: at the management, group, and individual levels. At the management level, the implications of continuous improvement are on the organisation’s strategy. Group level continuous improvement involves problem-solving tasks at a broad level, while individual level continuous improvement deals with improvement on a micro scale, i.e. on low level, day-to-day tasks. Continuous improvement programs can be applied to different types of work environments. Managers need to evaluate the product design, process choice, and the degree of standardization involved in the organisation, and can then decide upon the appropriate methods to use to best implement improvement practices.

According to Hyland et al. (2000), if organisations are trying to use continuous improvement as an ongoing process to sustain a competitive position then they need to focus their efforts on goals such as maintaining and improving quality, improving performance decreasing lead times and improving delivery reliability. To achieve these goals companies must select the tools that suit the people within the organisation. That is managers select tools that employees can use and understand. So that they are fully aware of what they are measuring and how they are helping to improve the overall performance of the organisation.

To test the continuous improvement as a variable for this questionnaire, the main principles of continuous improvement were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. All Employees are trained to implement the continuous improvement philosophy in their daily activity.

   As 1 2 3 4 5 Ds

2. Management spends a lot of time to improving company processes

   As 1 2 3 4 5 Ds

3. Employees believe that continuous improvement is a means towards gaining a competitive advantage

   As 1 2 3 4 5 Ds

4. Tools and techniques are the means for the company to adopt a continuous improvement philosophy.

   As 1 2 3 4 5 Ds

5. Our company depends on assessment and feedback to enhance its continuous improvement

   As 1 2 3 4 5 Ds

4.9.2 Cultures:

According to Hofstede, (1991) the culture is the collective programming of the mind which distinguishes one group from another and the sum total of beliefs, knowledge, attitudes of mind and customs to which people are exposed during their social conditioning. Assael, (1987) also defined the culture as "the norms, beliefs and customs that are learned from society and lead to common patterns of behaviour". While, the Oakland view in (2006) stated the culture in any business may be defined as how business is conducted, and how employees behave and are treated.

Many argue are made about the impact of culture on TQM implementation. Central to any culture is a common set of values which determine what is considered socially acceptable behaviour. According to Kano and Noriaki (1993), one needs to take cultural background into account when implementing TQM. However, the culture is not a barrier to the implementation of TQM.

According to Zairi (2006), reported that many of the TQM classification reviewed contain individual dimension or elements that could be interpreted as belonging to organisational culture or climate. A dimension is an aspect of a culture that can be measured relative to other cultures. Hofstede (1991), in study to describe the prevailing values in different countries, and has defined four essential cultural dimensions form the basis of the cultural situation in a country: concluded that appropriate dimensions were:

- Power distance: concerns inequalities in power and wealth between different layers of population.

- Uncertainty avoidance: Inhabitants of countries with high uncertainty avoidance tend to regard phenomena that are different in some way, as dangerous and threatening. These countries have a higher level of anxiety and put much emphasis on rules and regulations.

- Masculinity/femininity: Masculine countries tend to favour hard, rational, analytic values whereas feminine countries to a higher degree value softer more holistic and intuitive aspects.

- Collectivism/individualism: In some countries people tend to see themselves mainly as individuals and care mainly about themselves and their closest family. In other countries the group that a person belongs to is more important and forms the main basis for the identity.

Moreover, Oakland and Marosszeky (2006), the culture within the organisation is formed by following components:

- Behaviours based on people interactions.
- Norms resulting from working groups.
- Dominant values adopted by the organisation.
- Rules of the game for "getting on"
- The climate

Ngowi (2000), in study about impact of culture on the application of TQM in the construction industry in Botswana, aimed to highlight the influence of the organisational and national cultures on the implementation of TQM in the construction industry. The review showed that TQM is embedded in a culture that may or may not be consistent with the organisational and/or national culture of the host industry. Lagrosen (2002), companies cannot develop an organisational culture that differs substantially from the prevailing cultural factors of the country in which it operates.

Kangis and Williams (2000), explore the relationship between organisational climate and corporate performance. The results show that there is a consistent association between climate and performance. Independently of sector, companies performing above average show higher values on climate dimensions than those performing below average. Interest in organisational climate and its link with corporate performance is gaining momentum. The aim of their study is to contribute to this discourse by examining the extent to which

above and below average- performing companies also exhibit different climate measurements.

According to Beer et al. (1985), we might expect national culture to provide a barrier to the international diffusion of high commitment management. So, Black (1999) examines the linkage between national culture and high commitment management. The paper concluded that national culture plays an exogenous determining role in the adoption of high commitment management practices, with the result that the globalisation of high commitment management practices should be undertaken with sensitivity.

To test the Culture as a variable for this questionnaire, the main principles of Culture were used. The responses are rated on five point scales. Scale (5) is strongly disagree and Scale (1) is strongly agree.

1. Existing company culture is a barrier to the implementation of TQM philosophy.

   As 1 2 3 4 5 Ds

2. The current company culture is a barrier towards diffusion globally.

   As 1 2 3 4 5 Ds

3. A mixed- company in terms of culture is an advantage for adopting TQM

   As 1 2 3 4 5 Ds

4. Qatari traditions and culture contribute to resistance to change

   As 1 2 3 4 5 Ds

5. The company culture is formed from employments behaviour

   As 1 2 3 4 5 Ds

4.10 Analysis Procedures:

The purpose of the survey is to get different type of information including opinions, lifestyles and behaviours of the target population (construction companies' employees). The next step is to organize and analyse the data to find the relationships of interest in form of links or differences; and then to find out the conclusions based on the results obtained.

4.10.1 Triangulation

There are different methods of data collection that are commonly used in research such as qualitative method, quantitative method, for this study the researcher will use two sets of methods, qualitative method followed by quantitative method. This approach is known Triangulation which is broadly defined by Amaratunga et al. (2002), as "the combination of methodologies in the study of the same phenomenon". Creswell et al. (2003) stated that researchers have been referring to studies that combine qualitative and quantitative methods under a variety of names such as mixed model studies or triangulation.

Campbell and Fiske (1959), argued that more than one method should be used in the validation process to ensure that the variance reflected that of the trait and not of the method. So, by using this method, the data can be triangulated for same phenomena or issues using two different approaches, the first one as a background study and extend the finding from first one to follow the next one.

Jick, (1979) stated that triangulation provides researchers with several important opportunities. It allows researchers to be more confident of their results. This is the overall strength of the multi-method design. Also, it can stimulate the creation of inventive methods, new ways of capturing a problem to balance with conventional data-collection methods.

Zoltan, (2007) summarised the main characteristics of the mixed methods research in five points:

- A straight forward way of describing mixed methods research is to define it as some sort of a combination of qualitative and quantitative methods within a single research project.
- Increasing the strength while eliminating the weaknesses: The main attraction of mix methods research has been the fact that by using both qualitative and quantitative approaches researchers can bring out the best of both paradigms thereby combining quantitative and qualitative research strength.
- Multi level analysis of complex issues: It has been suggested by many that we can gain a better understanding of a complex phenomenon by converging numeric trend from quantitative data and specific details from qualitative data.
- Improved validity mixed: Methods research has a unique potential to provide evidence for the validity of research outcome through the convergence and corroboration of the finding.
- Reaching multiple audiences: The benefit of combining qualitative and quantitative methods is that the find results are usually acceptable for a larger audience than those of a single method study would be.

This study aimed to develop a framework for implementation of total quality management (TQM) in construction companies in state of Qatar. Therefore, it must to employ and utilize the adequate data collection and analysis methods which support the workability of the proposed model. The qualitative method has an ability to describe the current status of the construction companies in Qatar and highlighting the critical issues. Moreover, the quantitative methods can emphases on the critical issues that were found from qualitative method; also it has an ability to extract information that does not appear by the qualitative approach.

4.10.2 Qualitative Data Analysis

The interviews allow the researcher to extract important information from selected sample of population in order to analysis and draw the conclusions. Strauss (1998) defined qualitative research as any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification. Also, he adds that the term qualitative research is confusing because it can mean different things to different

people. Some researchers gather data by means of interview and observation-techniques normally associated with qualitative methods. Qualitative methods are proper way to understanding in a specific subject, or critical incidents. Bjorklund and Paulsson, 2003 in Stromgren, 2007 stated that the central is to get a deeper understanding of the studied problem, collecting, analysing and interpreting data that cannot be expressed in number.

Alam, (2005) in his study "the fieldwork and data collection in qualitative marketing research" showed that one of the strengths of qualitative research is that it enables the use of many different data sources through the process of triangulation of evidence. According to Ellram, (1996) the qualitative methods are least understood and most criticized research methods today. Generally, one can say that qualitative research is increasingly popular in the various fields of social science, including management studies.

Huby, and Smith (1995), indicated that the purpose of qualitative methods allows access to the process through which behaviours, systems or relationships are changed or sustained. They are particularly good at aiding understanding of how social systems, such as teams or organisations, function. Zoltan, (2007) mentioned that the qualitative research involves data collection procedures that result primarily in open-ended, non-numerical data which is then analysed primarily by non-statistical methods. Also, he listed the main characteristics of qualitative research:

- Emergent research design: In describing the main characteristics of qualitative research, most research texts start with highlighting its emergent nature.
- The nature of qualitative data: Qualitative research works with a wide range of data including recorded interviews, various types of texts and images.
- The characteristics of the research setting: Because of the qualitative objective to describe social phenomena as they occur naturally, qualitative research takes place in the natural setting, without any attempts to manipulate the situation under study.
- Insider meaning: Qualitative research is concerned with subjective opinions, experience and feeling of individuals and thus the explicit goal of research is to explore the participants' views of the situation being studied.

- Small sample size: Conducted qualitative research is very labour- intensive and therefore qualitative studies typically use, of necessity, much smaller samples of participants than quantitative one.
- Interpretive analysis: Qualitative research is fundamentally interpretive which means that the research outcome is ultimately the product of the researcher's subjective interpretation of the data.

The first step in analyzing the data is coding, the objective of the coding stage is to facilitate the data collected by broken down all responses in form of cods. Strauss, (2005) defined the coding as the process of analysing the data. Coding represents the operations by which data are broken down, conceptualized, and put back together in new ways. It is the central process by which theories are built from data.

After coding all responses collected, describing the answers would be an important step to facilitate the process of analysis. Bryman and Burgess (1994), emphasise the importance of describing and discussing research methods or techniques within the context of the broader philosophical, political and practical issues in which the research process of social research and cannot be separated from the research process.

4.10.3 Quantitative Data Analysis

Zoltan, (2007) described the quantitative research that involves data collected procedures that result primarily in numerical data which is then analysed primarily by statistical methods. Example for quantitative research is the survey research using questionnaire analysed by statistical software such as SPSS.

Robson, (2002) arguing that quantitative data analysis is a field where it is not at all difficult to carry out an analysis which is simply wrong, or inappropriate for our purpose. According to (Morrow 1994, in Alvessen and Deetz 2001) the predominant distinction between quantitative and qualitative methods in sociology serves primarily to conceal and confuse theoretical positions. This distinction focuses our attention on the techniques through which social life is representing social reality.

Saunders, et al. (2007), from their experience identified the distinctions between quantitative and qualitative data as in Table (4.2).

Table 4.2: The Distinctions between Quantitative and Qualitative Data

Quantitative data	Qualitative data
Based on meanings from numbers	Based on meanings expressed through words
Collection results in numerical and standardized data	Collection results in non-standardized data requiring classification into categories
Analysis conducted the use of diagrams and statistics	Analysis conducted through the use of conceptualization

The analysis was carried out by examining each statement of the EFQM elements in addition to the continuous improvement and culture elements which comprise most TQM principles. Each element contains five statements extracted from the previous studies as discussed in Section (4.8) and considered to be critical issues in relation to the TQM principles. The method of analysis was by determining the means and finding out the chi-square, and then comparing it with the table of Chi-square as in Appendix (C) where the significance test apply.

4.11 Statistical Methods:

According to Motulsky (1995), who discussed many different statistical tests to select the proper test, two questions are important to ask: (1) the kind of data collected; and (2) the goal, referring to Table (4.3) to decide the proper test.

Table (4.3), Selecting a Statistical Test

	Type Of Data			
Goal	Measurement (from Gaussian Population)	Rank, Score, or Measurement (from Non-Gaussian Population)	Binomial (Two Possible Outcomes)	Survival Time
Describe one group	Mean, SD	Median, inter-quartile range	Proportion	Kaplan Meier survival curve
Compare one group to a hypothetical value	One-sample *t* test	Wilcoxon test	**Chi-square or Binomial test**	
Compare two unpaired groups	Unpaired *t* test	Mann-Whitney test	Fisher's test (chi-square for large samples)	Log-rank test or Mantel-Haenszel
Compare two paired groups	Paired *t* test	Wilcoxon test	McNemar's test	Conditional proportional hazards regression
Compare three or more unmatched groups	One-way ANOVA	Kruskal-Wallis test	Chi-square test	Cox proportional hazard regression
Compare three or more matched groups	Repeated-measures ANOVA	Friedman test	Cochrane Q	Conditional proportional hazards regression
Quantify association between two variables	Pearson correlation	Spearman correlation	Contingency coefficients	
Predict value from another measured variable	Simple linear regression or Nonlinear regression	Nonparametric regression	Simple logistic regression	Cox proportional hazard regression
Predict value from several measured or binomial variables	Multiple linear regression or Multiple nonlinear regression		Multiple logistic regression	Cox proportional hazard regression

4.11.1 Statistical Inference:

According to Keller (2008), statistical inference is the process by which we acquire information and draw conclusions about population from samples. Motulsky, (1995) stated that there are two general procedures for making inferences about populations:

- Estimation
- Hypothesis testing

The objective of estimation is to determine the approximate value of a population parameter on the basis of a sample statistic. While, the purpose of the hypothesis testing is to determine whether enough statistical evidence exists to enable us to conclude that a belief or hypothesis about a parameter is supported by the data. According to Keller and Warrack (2003), there are three different measures that use to describe the center of a set of data. The first is the arithmetic mean, and computed by summing the observations and dividing by the number of observations. The second is the median and is calculated by placing all the observations in order and the observation that falls in the middle is the median. The third is the mode and is defined as the observation that occurs with the greatest frequency. Rang, Variance and Standard Deviation are used to measure variability. Standard deviation is a number that indicates how much each of the values in the distribution deviates from the mean (or center) of the distribution. Keep in mind that variance measures the same thing as Standard Deviation (dispersion of scores in a distribution). Variance, however, is the average squared deviations about the mean. Thus, variance is the square of the standard deviation. Some studies like Tari (2005), Lagrosen (2002), Mehra and Ranganathan, (2008) draws their conclusions from analysis the results of means and standard deviations only.

4.11.2 Chi Square:

Chi Square attributed to the Karl Pearson in 1900 and today is widely used to become one of the popular means of the statistical analysis. The purpose of the use of Chi square is to test the validity of the findings that are obtained from the statistical population comparing to the results obtained from the sample. Moreover, the researchers when they conduct a research or theory, usually need two or more variables, to look at being independent of each other or not, homogeneous or not. Therefore, Chi square tests can be used for independence and homogeneity in the test the hypothesis about the independence or homogeneity of the variables, whether quantitative or qualitative. Based on the Table (4.3), the proper test for the current study is the Chi Square test because the goal is to compare one group to hypothetical value and the sample size is adequate around 30. According to Koh and Owen (2000), for sample size less than 20, Chi- Square test can't use.

4.12 Validity and Reliability

Reliability is the extent to which a measurement procedure yields the same answer however and whenever it is carried out. While, Validity is the extent to which it gives the correct answer, Kirk and Miller (1986). The most basic way to estimating the internal consistency of an achievement test or questionnaire is to have a coefficient that takes into account the average correlation among all the questions or identifiable parts, Black (1999). Therefore, the researcher will present the draft of the questionnaires to the specialists to validate and agree to the clarity and accuracy of each statement.

Cronbach's Coefficient (α) will be calculated to estimate the internal consistency of reliability of a measurement scale. Cronbach's Coefficient is a reasonable indicator of the internal consistency of instruments that do not have right or wrong marking schemes, thus can be used for questionnaires using scales such as rating, Black (1999). Cronbach's alpha coefficients should fall within a range of 0.70 to 1.00. Sun. et al. (2007), Cronbach's alpha is widely used in social science research to estimate the internal consistency of reliability of a measurement scale. According to (Nunnally, 1978 in Pallart, 2007), recommends a minimum level of Cronbach's alpha is 0.7.

4.13 Summary

In this chapter, research methods adopted in this research are described in detail. A panorama of primary research methodologies is described in Section 4.2. The research resources, tools, sampling methods and data collection procedures are discussed. The procedures of data analysis which include comparison of different data collection methods adopted in this study which was mainly combination of both the qualitative and quantitative methods. Brief descriptions of the statistical methods to be adopted in the analysis the finding are presented in this chapter. The next chapter will discuss the results and analysis the findings.

Chapter 5 Survey Results and Analysis (Qualitative)

5.1 Introduction

The aim of this chapter is to discuss and present the results of the case study conducted in one of the largest construction companies in the State of Qatar. The interviews began by the permission from the director of the company after the purpose of the study was explained to him by the researcher. Section 5.2 provides a brief introduction to the selected case study by presenting company background, followed by the company's official organisation chart and quality system already implemented in the company. Section 5.3 focuses on the results and discussion of the interviews using the qualitative method. Finally, Section 5.4 provides a summary of this chapter.

5.2 Case Study

5.2.1 Company Background

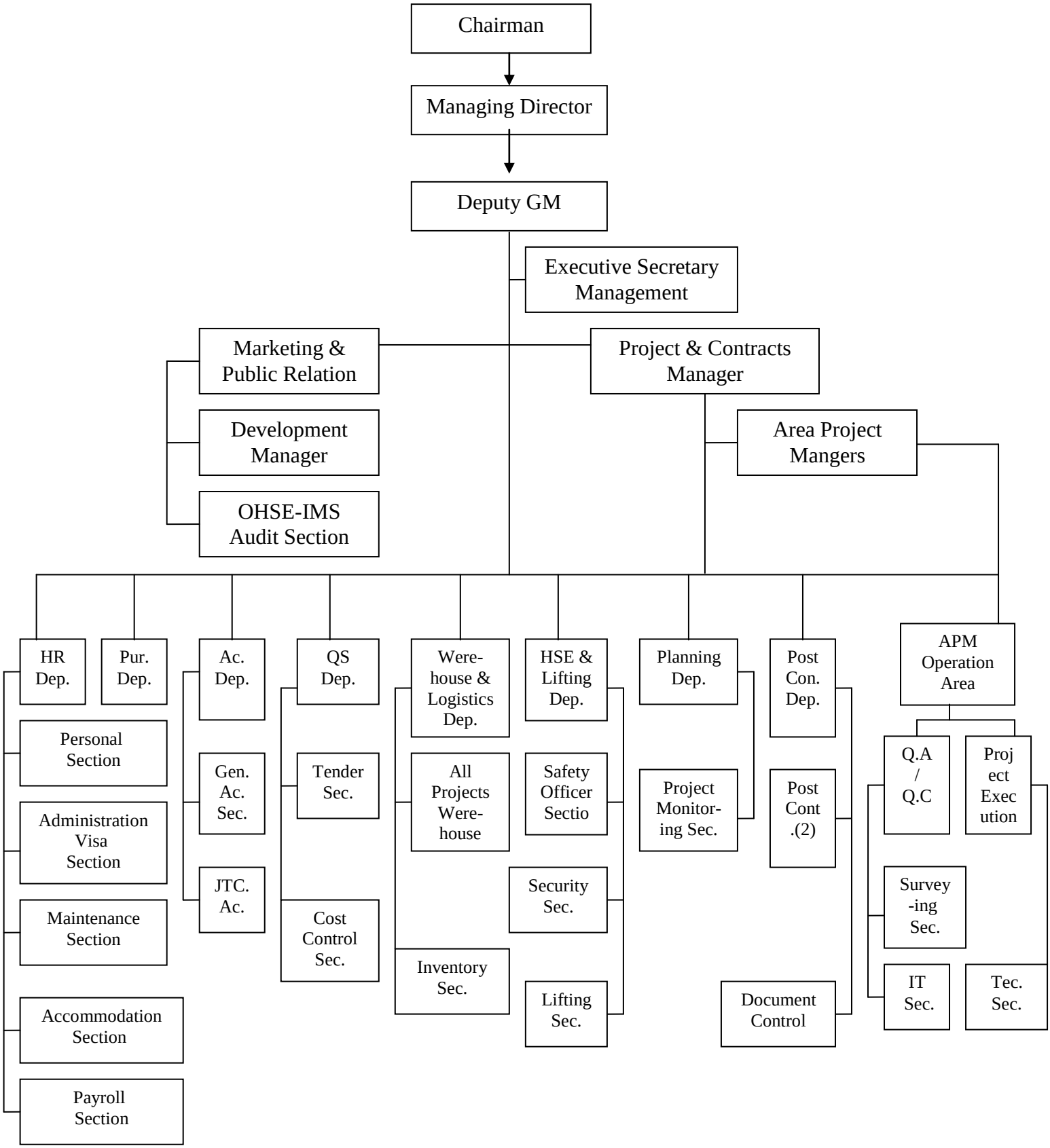
The case study was conducted in one of the large size construction company that was established in 1976. It is located in the State of Qatar. Aljaber Trading & Contracting (JTC) has become professional in the construction industry, achieving a higher quality of work through its understanding of customer requirements and expectations. It has become one of the best-known construction companies in the State of Qatar. Like most of construction companies in Qatar, JTC is a family owned company. Therefore, the management authority and commitment for critical decisions are limited and needs the owners' commitment and approval for any kind of change. JTC is committed to providing quality construction services and products through fulfilling the integrated management system which contains three systems of ISO, **standards quality management system, health and safety management system, and environment management system.**

The company has been implementing and developing integrated management systems which is known as (QHSE) that meet the requirement of Quality ISO 9001:2000, Health and Safety 18001:1999, and Environment 14001:2004 standards, which aim to satisfy the needs and requirements of its customers. Owing to its good quality management and

through its dedication of work, the company has been rated as a grade (A) contractor as shown in Appendix (B) for roads, pipelines, buildings, infrastructure, and electro-mechanical works.

The company policy is to employ highly qualified engineers, and it enables them to gain extensive experience in different fields of construction and construction technologies. The strength of JTC lies in its capability in delivering projects on time and with quality of work through an experienced staff of engineers, consisting of more than 8000 people. The average contracts value of the projects is around $300 million annually. Even though, the company didn't classify themselves as TQM organisation, but its philosophy derives from adopting the integrated management system of ISO, and the code of ethics observed from professional engineering practice and project management professionals. The company's organisational structure is displayed in Figure (5.1).

Figure 5.1: Company's Organisational Structure



5.2.2 Quality System

As mentioned previously, the company follow the QHSE manual, which they integrated to meet ISO requirement. The main purpose of the QHSE is to document the company's policy and guidelines to employees, other interested parties and general public, whose actions affect product quality, health, safety as well as environment in the course of their day to day activities. It also includes the responsibility and authority of all personnel who mange, perform, and verify work- affecting quality, health, safety and environment and having responsibility in implementing the processes have been defined and documented. The process of interaction between departments, also described on the manual, contained following flowcharts:

- Customer inquiry to submittal of quotation process
- Project acceptance, scheduling, implementation& Monitoring process
- Health, Safety& Environmental Process
- Project quality inspection/ feedback process
- Resources Management Process.

The last part of the manual covered the integrated management systems (IMS). It has six mandatory procedures summarized below:

- **Document & Data Control Procedure**

The purpose of this procedure is to define the manner in which all required documents within the JTC Company IMS are controlled.

- **Control of Record Procedure**

The purpose of this procedure is to establish and maintain records to provide evidence of conformity to ISO requirements and of the effective operation of the IMS.

- **Management Review**

The purpose of this procedure is to ensure the continuing suitability and effectiveness of the IMS in meeting the requirements of ISO, OHSAS standards and the company's IMS policy and objectives, this procedure applies to all management review activities.

- **Internal Audit Procedure**

The purpose of this procedure is established for planning and carrying out independent internal audits at planned intervals to verify whether QHSE activities comply with planned arrangements. Also, determine whether the IMS conforms to the requirements of the ISO, and whether IMS is effectively implemented and maintained.

- **Control of Non- Conforming Product / Service**

The purpose of this procedure is to ensure that products, processes and services that do not conform to specified requirements are identified and prevented from inadvertent use.

- **Corrective & Preventive Action Procedure**

The purpose of this procedure is to define JTC processes needed to eliminate the cause of nonconformities in order to prevent recurrence and determine the required action to eliminate potential NC before it happens.

5.3 Results from Qualitative Methods

The interview questions were prepared in light of the theoretical study and views of professors. The interviews were conducted at one of the major companies classified as an ISO certified company even though they do not consider themselves a TQM organisation. The interviewees were from different levels of the company organisation structure, because the main objective of the interview is to identify the level of TQM awareness among construction companies in Qatar. It also wanted to clarify the challenges and

obstacles they faced in attempting to adopt and implement the TQM philosophy. A total of 29 interviewees were sampled as in Table (4.1), chapter 4.

5.3.1 Job Description & Responsibilities

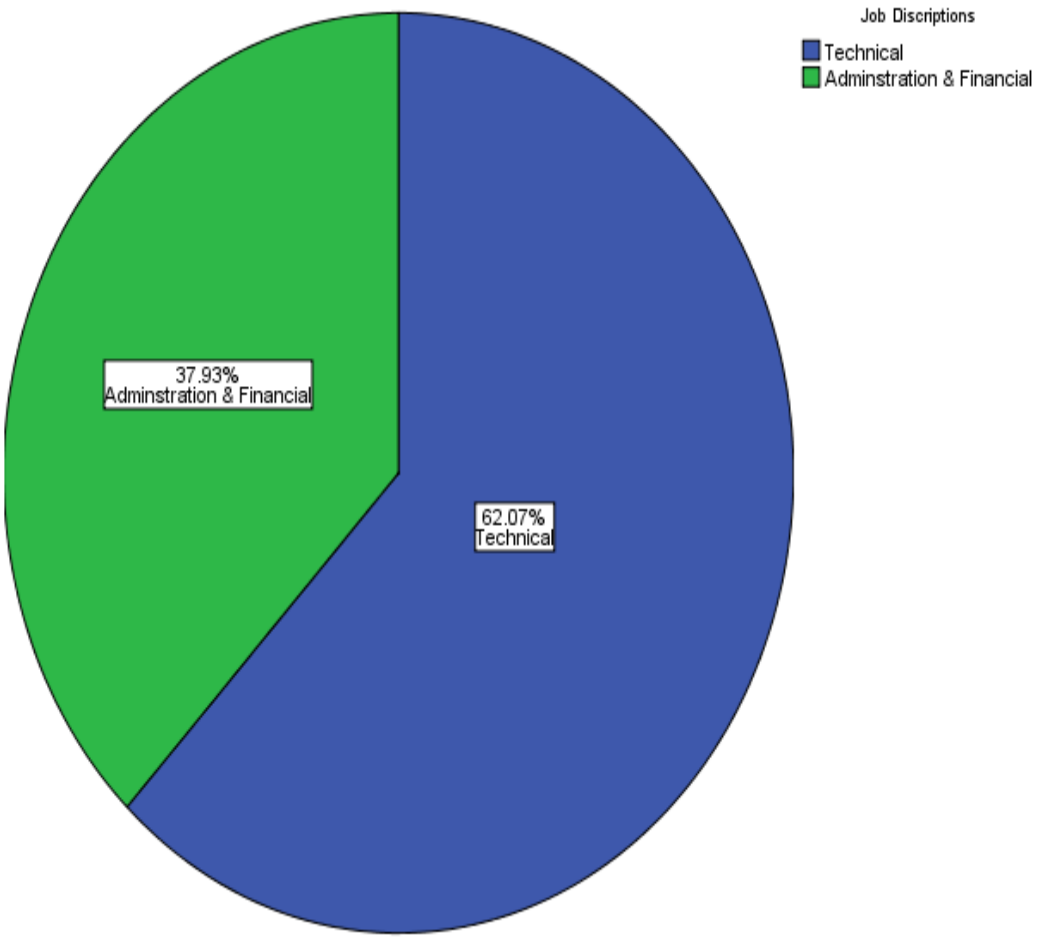


Figure (5.2): The Main Departments in Construction Companies

The purpose of this section is to explain the general ideas about the people who were employed in the construction industry and their responsibilities. The organisational structure in the construction company can be classified into two main departments as shown in Figure (5.2); the first department is the *administration & financial department* and about thirty eight percent of the respondents are from this department. Also, department was established to support the processes of all company operations; also, under this department, there are many sections with different responsibilities, such as the Human Resources office is one of the important sections in the administration department

because it executes many duties related to the employees. Respondent no.16 explains this when he says:

> "I'm working with JTC as an HR officer. My responsibilities include processing the Visa request of the new recruits and upon their arrival processing their passport details and giving them an employee card number"

Since the availability and managing of the financial resources is an important factor in the success of any construction project, some of the respondents to this question therefore have direct or indirect relations to financial control. For example, Respondent no.12 summarised his duties in the following:

> "I'm a cost control Engineer working in the cost control department. My responsibility lies in creating and checking the budgets of the projects, and to make sure that each project follows these budgets, and to make sure projects are on the road to success"

Also, Respondent no. 24 has different responsibilities related to financial control as a cost controller manger and says:

> "My current position is cost control manager. My responsibilities are as follow:
>
> - Controlling the budget for the projects.
> - Monitoring and checking the expenditure of projects.
> - Managing the IT department.

Moreover, since the construction industries deal with the huge number of documents related to the workers on one hand and government requirements on the other hand, therefore, many of the respondents from the personnel section deal with the international employment requirements. For example, Respondent no.11 says:

> "I am working in the visa and government relations section as a leader and senior assistant administration manager. My responsibilities include supervision of all government processes like visa issuing and renewing…etc. and also have

supervision of the file section and also solve labour problems with labour department".

The second department is the *technical department.* Since**,** all projects managers, quantity surveyors, quality controllers and site engineers are classified under the technical department, therefore the technical department may be considered as the core for the construction company. Also, the majority of the respondents - about *sixty two percent* - are from technical departments. For example, Respondent no.1 is from the quantity office and he described his responsibilities in a few words:

"I'm responsible for all related Quantity office works such as correspondences from client, consultants, subcontractors and suppliers, also preparation and submission of variations/ cost proposals".

Even though Respondent no.10 works in the quantity office, he described his duties in a different way and says:

"A quantity surveyor takes off quantities prepares sub-contract agreements, cost proposals for variation, deal with enquiries, makes comparisons of quotations, deals with correspondence material and shop drawing submittals, monthly progress reports and the monthly evaluation"

Some of the respondents are from the quality section and they described their responsibilities by different ways. As Respondent no. 21 says:

"I am a QA/QC engineer, responsible specifically for infrastructure. Quality of work must be carried out especially with respect to the following of plans and specifications.

Some of the respondents are from controlling section, as Respondent no.5 says:

"I'm a document controller engineer; my responsibilities are to input all the correspondences received such as Data from sites, subcontractors and suppliers to the corresponding projects, using the primavera software."

While Respondent no.25 includes more aspects in his responsibilities such as random visit inspection he says:

> "As an ISO Internal Auditor it is my responsibility to conduct internal audit on all project sites and departments, to perform random visits and inspection in order to verify the effectiveness of IMS implementation. Moreover, I'm responsible for the control and documentation of all IMS related records, such as documents, form, work instructions and procedures.

Also, Respondent no.19 emphasises the above by including training, insurance, health and safety as part of his responsibility and says:

> "I'm working as development manager in charge of (QHSE) quality, health, safety and environment, as well as training development, insurance, claims, internal & external auditing system, quality control and quality assurance in the field."

Some of the Respondents are in direct contact with the projects and workers as well. For example, Respondent no. 18 described his duties in the following:

> "My current job in this company is as site engineer. My responsibilities are to monitor progress of work, make inspection for finished work, make a daily program of activity, and make a weekly program of activity."

Although other respondents have direct contact with the sites, they have different responsibilities such as in the case of Respondent no.22, who says:

- Following up time schedule, resources, cost schedule and updating.
- Conducting weekly meeting with consultant to address main schedule.
- Conducting sub contractor meeting to insure that their progress at works is as per baseline schedule.

Analysis:

The employees of construction companies in Qatar are divided into two categories. The first is the technicians such as engineers, and the second is the administrative personnel such as accountants. The organization structure that in working processes is difference from that in company documentations. During the process, it was discovered that the actual organization structure in size of the company was different and much smaller than the one that officially have been officially stated in documents as in Figure (5.1). It is envisaged that this is due to the level of prestige in which they work and wish to project themselves in a manner that is most suited to the company and the biggest way possible to project their profile. This finding was considered significant because certain size of organization structure is one of the requirements for ISO certification and this proves that ISO certification has certain limitations, as certain requirements are only met on paper and not existing in practice. Therefore, it can be stated that the element of ISO certification related to structure does not work in construction industry in Qatar as big players exploits the loopholes to achieve ISO certification, as it became apparent during the research process within the company that is regarded as one the leading construction company in Qatar and the size of the company is not that big, as projected.

5.3.2 Individual's Background

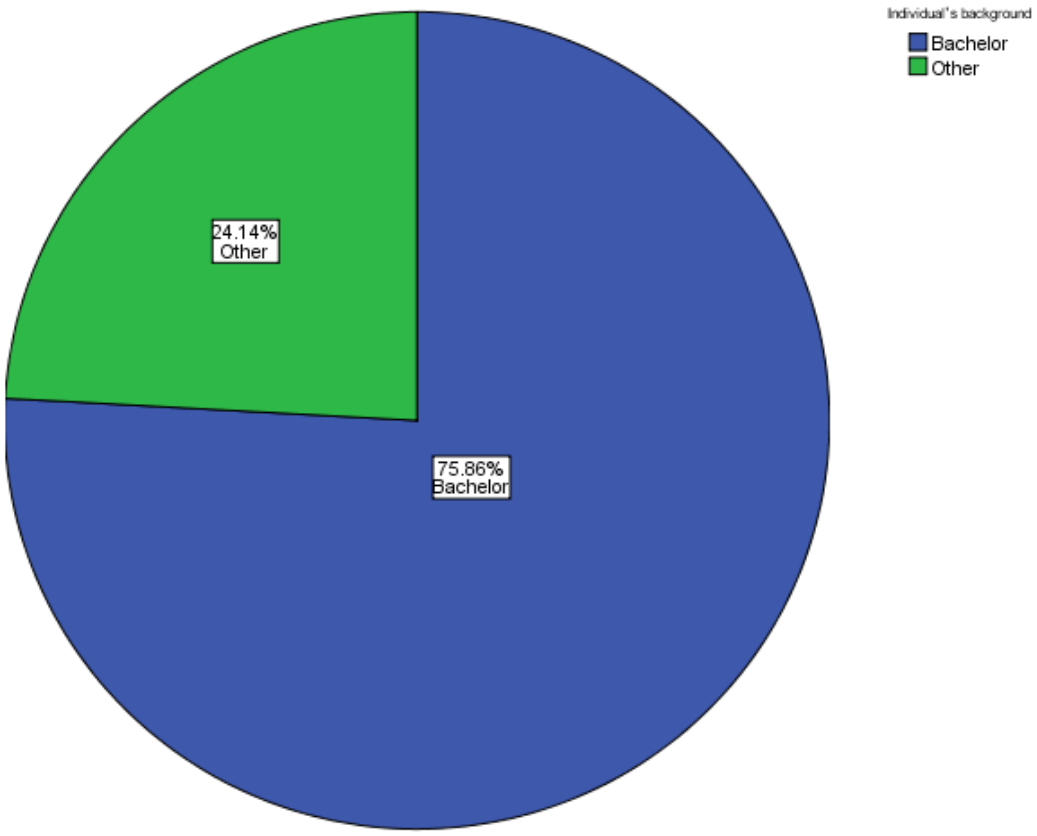


Figure (5.3): Background of People Working in the Construction Industry in Qatar

The design of this question is to determine the levels (education) and background of people working in the construction industry in Qatar. As shown in Figure (5.3), the majority of the responses *(almost seventy six percent)* to this question showed that they hold *a degree* especially in civil engineering, but with different experiences. For example, Respondent no.12 says:

> "Well, I'm a civil engineer. I graduated in 2004. I worked in my country as a site engineer for a construction company, and then I joined this company as a site engineer".

> Some of the respondents are working in positions *not related to their education or background* as in the case of Respondent no.6, who graduated in Aerospace Engineering but he described and explained his responsibilities as the:

> "Technical advisor for HSE and security Division, and my responsibility is more focused on managing all administrative and technical works under HSE & Security Division".

Also, some of the respondents are *working for the first time* in their current position because they were transferred from another section to the current section for the purpose of filling the gap. This issue emerged through Respondent no.9

> "This is the first time for me I work in human resources because I transferred from another department into the human resources department".

The respondents' length of *experiences varied considerably.* For some of them their experience was about 3 years as in the case of Respondent no. 17 say:

> "I have been working as a field engineer in my country for 3 consecutive years. I've finished my B.SC in college and am a licensed civil engineer."

However some of the respondents have experiences of more than 27 years. For example Respondent no.28 says:

> "I have been a licensed civil engineer for more than 27 years."

Moreover, the experience of some of the respondents is more focused in a segment of the project such as focusing on only finishing a part. For example, Respondent no.27 says:

> "My experience focuses most in finishing and architecture fabrication in all types of projects."

Analysis:

It is emphasised in the company policy documents that one of the company policies is to employ highly qualified engineers, which enables them to gain extensive experience in different fields of construction and construction technologies. Also, it was learnt during the interview process that nearly all of the employees' had a university degree, especially those working at the senior levels, such as the heads of departments or heads of sections. Usually, the heads of departments are people who have more experience. The employees (professionals and labourers) hail from different countries. Moreover, it was established by the researcher that there are no Qatari nationals working for construction companies in Qatar as labourers and very few work at senior levels.

5.3.3 Recruitment Process

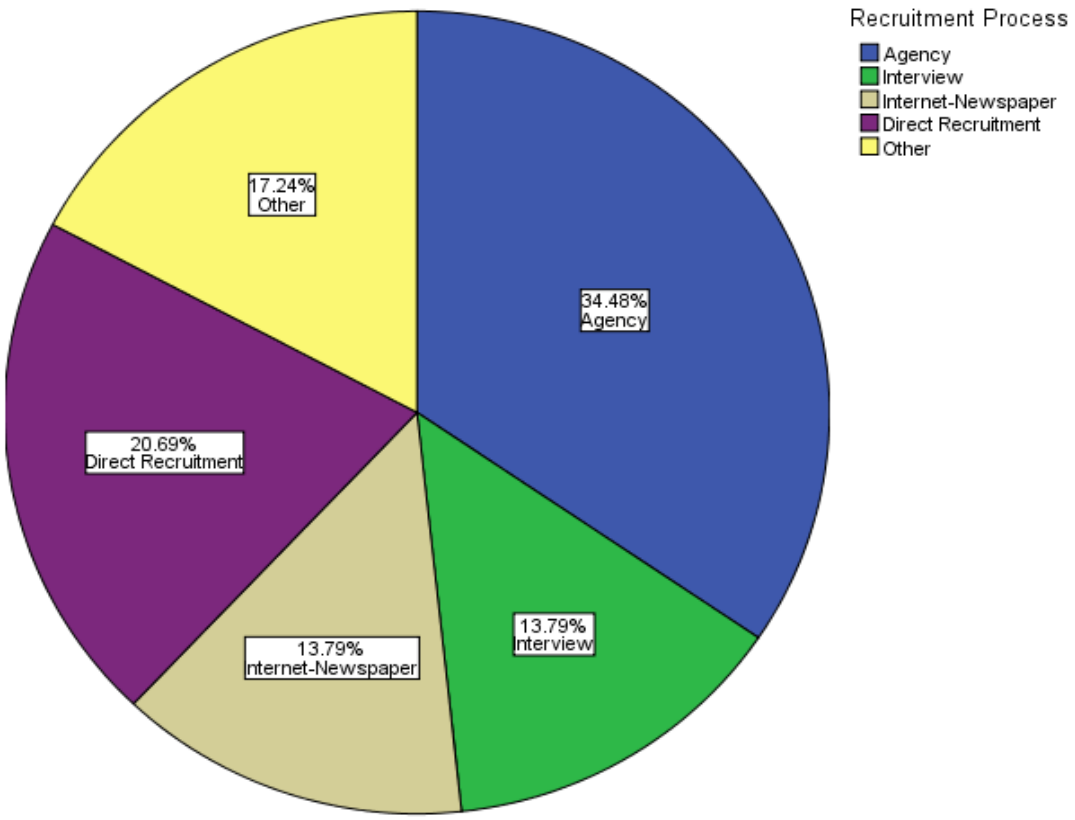


Figure (5.4): Recruitment Methods Used in the Construction Company

This section is designed to determine the recruitment methods used in the construction company and to explore whether the recruitment policy in the company has any type of favouritism. According to Figure (5.4) the majority of the respondents (about thirty four percent) were recruited through an *external recruitment agency.* The interviews were sometimes executed by the *company representative* as mentioned by Respondent no.4:

> "I learned from a recruitment agency that a manager was coming to the Philippines to recruit manpower. I sent my application and they scheduled me for an interview after I passed the interview, a job offer was made and after a month from accepting the offer my work visa was released. Then, I was scheduled for my flight to Qatar".

Otherwise the interviews were executed directly by the recruitment agency as in the case of Respondent no. 15, who says:

> "I came to know about this company through manpower agent in Mumbai, (INDIA). I applied there for interview and I was selected."

Twenty one percent of the respondents were recruited by direct *interview* with the company managers in different departments. For example, Respondent no.21 says:

> "I joined this company through interview in my country with one of the company representatives and I was hired as a QA/QC engineer and my experience is related to the required job. The quality of recruitment done by company representative is very high in which the questions asked during the recruitment process were very relevant to my experience and the requirement of the job to be carried out at the company."

Some of the respondents almost (fourteen percent) who were recruited had started through an *internet website or a newspaper* advertisement as in the case of Respondent no18, who says:

> "I came to this company through a job advertisement in the newspaper".

Or in case of Respondent no.25, who says:

> "I applied through an internet website for the vacant position as ISO Internal Auditor and posted by PERT/ CPM recruitment Agency. The agency called me up for interview with the employer in September 2007".

Almost twenty one percent mentioned that they had been *directly recruited* through company top manger for example Respondent no.24 says:

> "I was recruited directly by the manager of the company straight after my graduation".

A very few of the respondents, not more than fourteen percent, were recruited through direct methods of recruitment. For example, through their *friends* working in same company or direct hiring through managers, as Respondent no.23 says:

> "I came to this company, through friends".

Or sometimes they *transferred* from other departments, as in case of Respondent no.11 says:

> "They transferred me from another department to human resources and this is first time I have worked in this department."

Analysis:

The interview is related to the recruitment methods used by construction companies in Qatar. The results show that there are a number of recruitment methods employed by the construction companies, such as, direct interviews, the internet, and newspaper advertisements. The preferred method most commonly used in the State of Qatar to recruit new employees is via recruitment agencies. The advantage of using a recruitment agency is that they offer a replacement service to any worker unable to achieve company requirements within an agreed time. The researcher observed that construction companies in Qatar prefer recruiting recent graduates or young employees especially engineers for the technical department because; 1- they cost less, therefore provide value for money and 2- easier to control / train, as they are fresh and can be easily moulded to a specific field.

5.3.4 Relationship with Other Staff / Boss

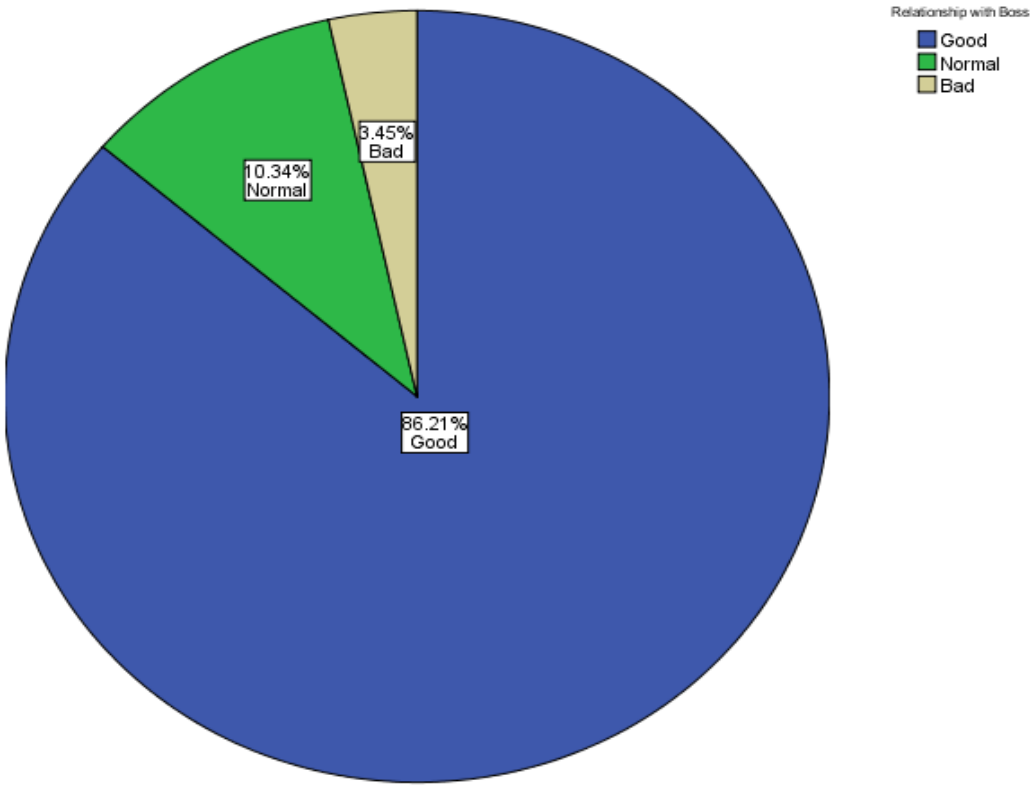


Figure (5.5): The Relationship between Colleagues in the Organisation

This part concerns the relationship between colleagues in the organisation. It is interesting to see the majority of the respondents - more than eighty - six percent Figure (5.5), enjoy *good relationships* and they are *happy* with their bosses or colleagues, describing each other in terns of praise such as "wonderful", "works professionally", friendly" as Respondent no.2 says:

> "I should really thank God for putting wonderful people around me in my work. My colleagues are very cooperative and they help me in every way. My boss is very good and I like his systematic way of working and the way he treats others. Overall, I'm so lucky that I'm in the HSE department".

Also, some of the respondents use that good relationship with others to *exchange ideas* and increase their performance. For example, Respondent no. 10 explained this in few words:

"I have a good relationship with my fellow Qs. We are exchanging ideas to improve our performance further. My boss is very supportive in all aspects and very patient".

Respondent no.3 uses the concept of *teamwork* to describe his relationship with others and he adds:

> "All people work as a team and maximum effort. My boss helps me as I need to fulfil our job responsibilities"

Some of the respondents - about eleven percent - tried to evade the question by talking about the *cultures* of the people concerned. As Respondent no.1 says:

> "They are of different cultures and attitudes; some of them are very interested and work harder than others".

Sometimes they talk about the means of *communication* with their boss. As Respondent no. 19 said:

> "Since my boss is giving me the responsibilities of looking after the quality management system, health and safety, so different things come by sending a memo or making a telephone call to discus these issues and solve them. Sometimes I have to go to my boss and discus the problem or issue face by face."

Very few- around three percent hold an opposite opinion, *against* their bosses. For example, Respondent no. 17 described his boss by saying:

> "Since I'm an alien in this country, I have to adjust to the attitude of the people around my place of work. About my superior / boss, he is kind of a selfish person. He doesn't know how to be a leader. He thinks only of himself."

Analysis:

The relationships among employees in construction companies are usually positive especially amongst those from similar cultures as often depend on the communication level between employees. Relationships between employees and their bosses may be tense since employees may complain of low salary or having their opinions ignored. In general the positive relationship between employees is a positive sign for the implementation of the TQM philosophy.

5.3.5 Quality Definition/ Description

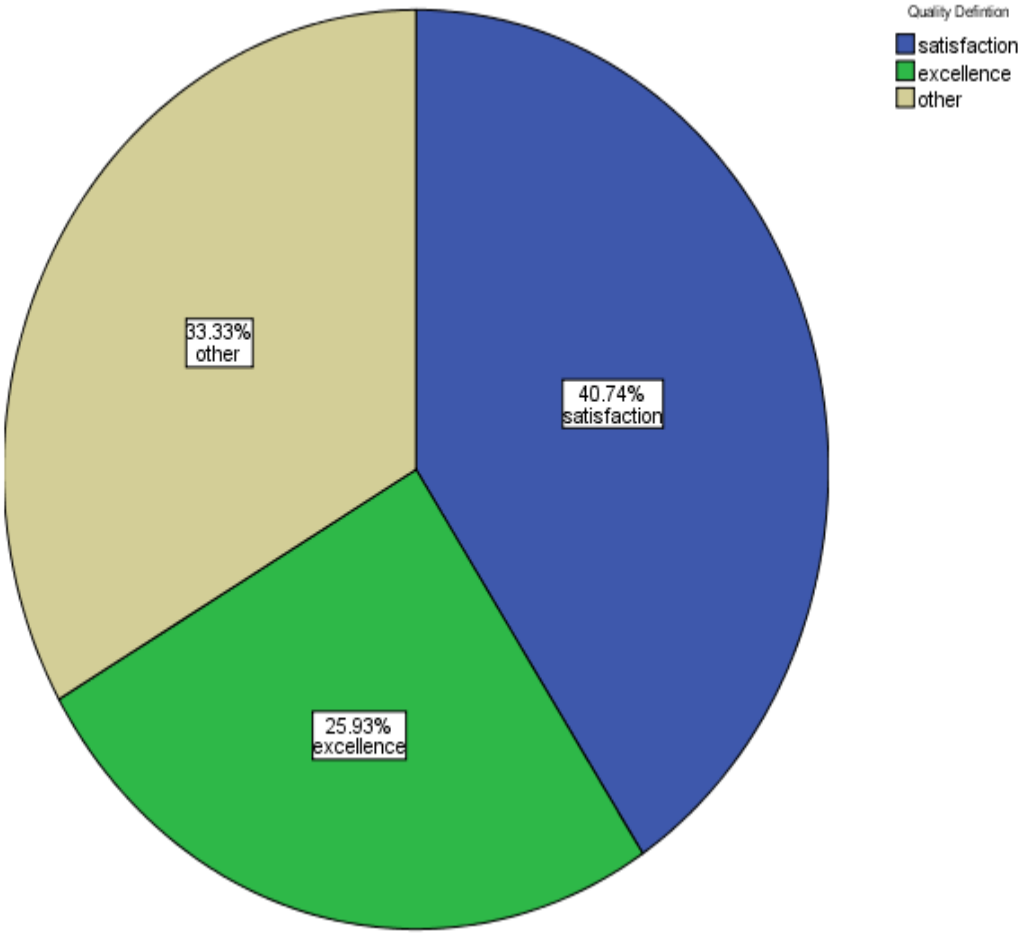


Figure (5.6): Meaning of Quality

The purpose of this part is to confirm whether the interviewees have an understanding of the meaning of quality and how they describe the quality concept. As shown in Figure (5.6), the majority of the respondents almost forty one percent agreed on that the quality is *satisfaction of the customers*. For example, Respondent no. 3 said:

> "Quality is to achieve the maximum level of customer satisfaction with out any defects."

Also, Respondent no. 2 agreed from above and adds that the quality is more *important than quantity*, as he says:

> "Quality means the way we deliver and the outcome of a certain process. To my knowledge, quality is customer satisfaction and quality defines the worth of a company. In my opinion Quality is more important than quantity."

Respondent no. 12 mentioned that one should be *satisfied by his work* and he says:

> "Quality is to do and finish the job in a perfect way or in the minimum number of mistakes. So you can be satisfied with the work you have done."

Moreover, Respondent no. 16 goes beyond customer satisfaction to *exceeding the expectation* of your customer, as he says:

> "In simple words quality means value for money. Quality is all about exceeding the expectation of your client. Quality is something which can't be judged by the performance of one or two members, but the whole team."

Quality is the *key to success.* This statement was added by Respondent no.26, who gave this definition of quality, as he said:

> "An inherent and distinguishing characteristic that keeps our customers and staff satisfied. Also, it provides positive feedback on our input. In short, "Quality is the key of success".

The views of others- almost twenty six percent of the respondents - defined quality as *excellence* of the work, as Respondent no.6 says:

> "Quality is a degree of excellence. It is a class and superiority of relative nature or character. For me, quality is the eminence and value relative to high social standing of standards in products or service".

This definition is emphasised by Respondent no. 21, as he says:

> "For me, quality refers to excellence, superiority or class of a specific work. Quality means to me, it's a value or worth of output product of a particular company or industry."

Moreover, Respondent no.5 agreed on this definition by saying:

> "Quality for me is the "Doing of Excellence", Quality is the maintaining of the standards (of a company) in products or services."

However, the remaining respondents - almost thirty three percent - have different opinions such as Respondent no. 4, who relates the definition of quality to *procedures* and he says:

> "I define quality as something to do with procedures. In order to achieve a good quality of anything, there should be a step-by-step procedure to follow. The procedure should also be a guide to achieving quality."

Also, some of the respondents limited the definition of quality only to their job, such as Respondent no.22, and since his job is related to time, so he focused the definition only to time as he says:

> "To a planner, quality means to complete the project on time according to contract specification".

In addition to this some of the respondents are experts in quality, or their works is related to quality issues, so they define the quality in a *broader view* and include more aspects of the definition, as Respondent no.19 says:

> "Quality is not only about having things done, but is about managing people and it is about how a proper procedure can be handled efficiently. Quality is to ensure that there is no defect or there is no more waste of materials or time when you are doing something in an efficient way, so being efficient means you do the work in a proper way; we talk about being people-oriented, how people deal with other and with their bosses and working as a team to meet goals".

Analysis:

The interviews clarified that the concept of quality is known term in the construction industry. Most employees had some idea of the concept as it appears in literature such as Feigenbaum and Deming quality definition, the definition of whom focus more on customer satisfaction and excellence at work, although only from a very narrow perspective. The views of employees on the concept of quality are focused on the end results and ignored the processes towards achieving it.

5.3.6 Example of Quality (Issues Related to Quality)

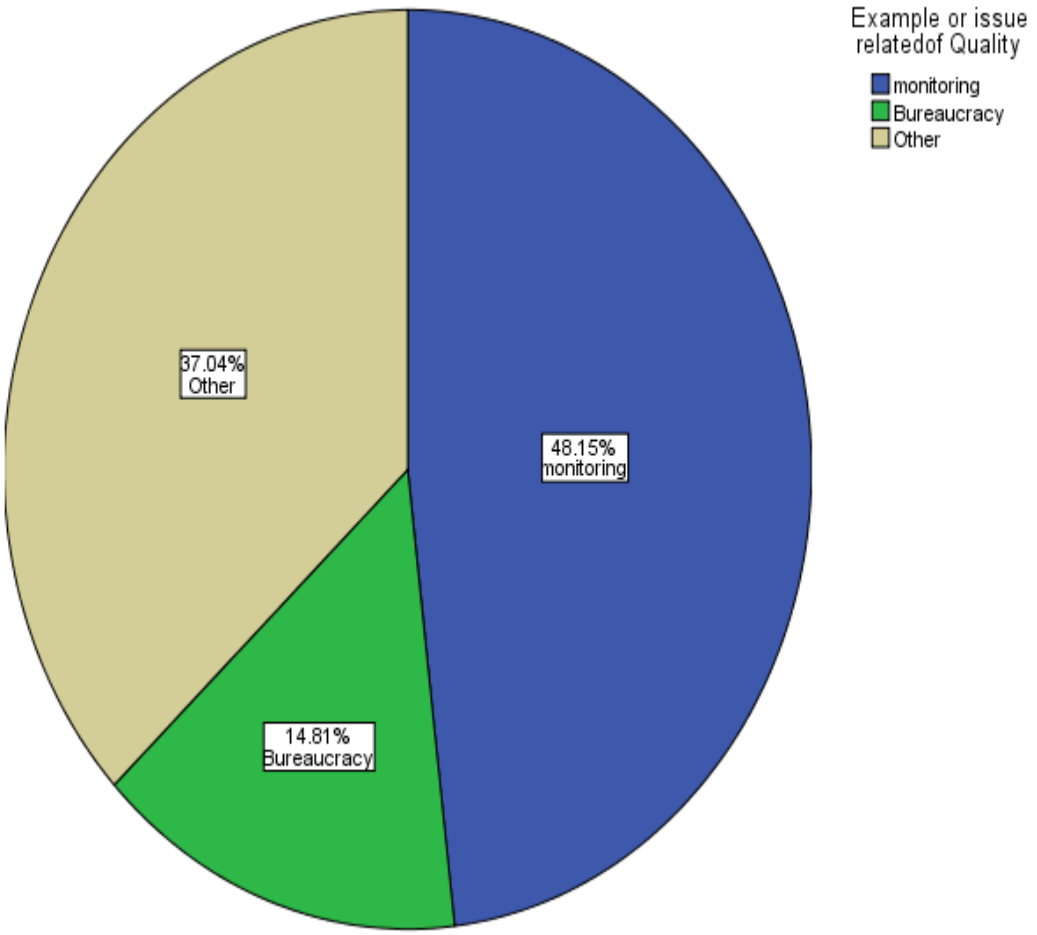


Figure (5.7) Main Quality Problems which Face the Construction Industry

The main objective for this section is to identify the main quality problems which face the construction industry and to confirm the ability of the people who are working in this industry to refer their problems to a degree of quality application in practice. Figure (5.7) shows that the majority of the respondents - almost forty eight percent referred their examples to the *monitoring* but from different points of views. For example, Respondent no. 10 gave an account of incident which happened to him and because of existing good monitoring or checking procedures, they were able to rectify the problem, as he says:

> "The job of a quantity surveyor is very critical because we are responsible for pricing the projects in the tendering stage and if the pricing is wrong the company loses a lot of money. This incident happened in one of the projects when I made a mistake in calculating one of the items by moving one decimal from 1,400,000 to

> 140,000 and if this calculation had not been rechecked by another colleague, I would have been put in a bad situation with my boss."

Another example is discussed by the Respondent no.22 regarding the importance of checking in rectifying the problems, as he says:

> "Since we use primavera software as a computer program to plan and schedule our projects including their durations, and because I'm not reviewing the output, the client receiving the project schedule as showing that the project will be finished in September 2100 whereas it should be finished in September 2010, but we corrected the mistake after that with our apologies to the client."

Moreover, Respondent no.17 mentioned a real case where he experienced a recurring problem and because of the proper monitoring system, he was able to fix it, as he says:

> "Part of my job is to check the concrete before casting, and sometimes we received concrete containing more water, so I had to do something to solve this problem with out delaying the work, so I asked one labourer to add more cement to the mixer to get a good quality of concrete".

In addition about thirty seven percent – gave their examples of quality issues that focus on different aspects, such as Respondent no. 6 as he is working in the security division, he gives an example of something related to his job. He says:

> "In our work, there are many problems we face. For example, one of the safety requirements for workers is the wearing of safety shoes, but the quality of the safety shoes delivered is very poor and they work for a maximum of one month and then wear out".

Few of the respondents- not quite fifteen percent of respondents referred in their examples to the *Bureaucracy* which occurred in some daily activities. For example, Respondent no.7 says:

> "The E. government is the new system in Qatar established to implement government transactions in a proper way and much faster, which should help us to complete our work from the office, but sometimes the system goes down or is slow. This happened to me last week when one of the workers wanted to travel back to his country in an emergency, and I tried to issue the exit permit for him but because of a problem occurring in the system at that time, his flight had departed before I completed his papers, and finally he travelled on the next flight."

Also, Respondent no.26 had an incident occur, and he connected this incident to the complexity of the procedures which were used. He says:

> "After my selection in this organisation, when I landed in Qatar and I did not find any person with a sign board or other identity to meet me, I felt quite ill at ease. I went out of the airport and I asked some people about my organisation, and somebody indicated a man who was collecting new staff. I moved across to that person and started to converse in English. I was surprised to learn that the person appointed to meet new staff at the airport did not know English. I faced a very tough time with him. He checked my visa and said "okay". I had no option but to follow him with out any prior reassurance. I felt relaxed the next day when I joined the office. This gave me quite a bad impression and I realised that care should be shown towards the employees."

Analysis:

The interview revealed that most interviewees failed to provide any related issues or cases that have an impact on the concept of quality. Most of the examples given were far from the concept of quality. However, the main problems relating to the quality issues in the construction industry are summarised as a lack of monitoring and an excessive bureaucracy that exists in some of the operation processes.

5.3.7 Challenges Specific to the Construction Industry

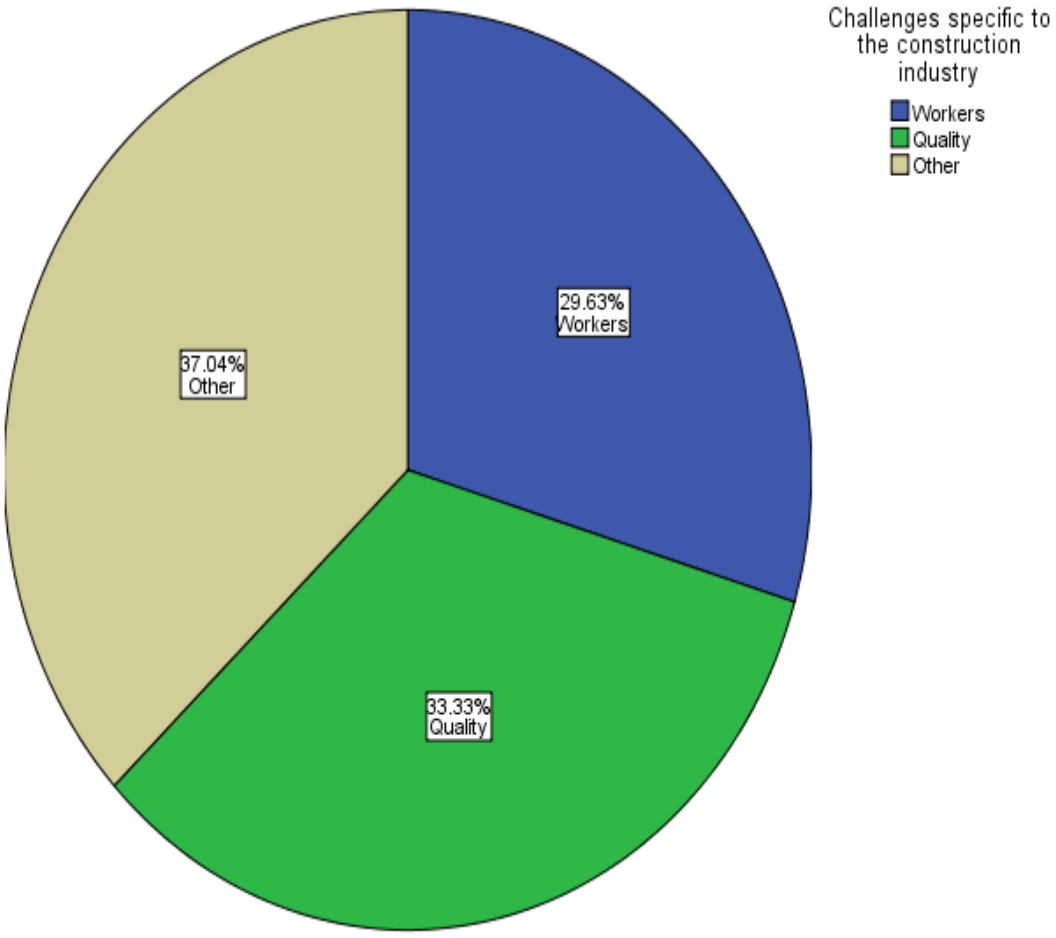


Figure (5.8): Challenges which Face the Construction Industry

This section is about the challenges which face the construction industry. As clear in figure (5.8), the majority of respondents to this question - around thirty three percent - mentioned that the challenges is in the difficulties of *implementation of such a quality system* in the construction industry. As Respondent no. 21 said:

> "The challenge is one of how to impose or implement strictly the total quality in the site, because being a QA/QC engineer is not very easy. You can have a big argument with all the engineers in the site, and defend your knowledge and ideas about the quality of work which most site engineers take this for granted."

Respondent no. 25 emphasises the proper implementation of a quality system as he says:

> "The main challenge is the actual implementation of an Integrated Management System in the construction industry. The challenge lies in how to provide and establish process control, control of nonconforming products/ services and the effective implantation of corrective and preventive actions."

On the other hand, some of the respondents -almost thirty percent focus on the challenges mainly to the *workers* at all company levels, but from different points of views. Some of the respondents spoke about the *cultures of the labourers* who are working in the construction industry, as Respondent no.11 says:

> "The huge number of people from different cultures and backgrounds that I have to deal with is one of the challenges I face."

The other points of view indicated that the main challenge they face is a *communication problem with the workers* as Respondent no. 9 says:

> "In my job since I am dealing with different people, I face some communication problems with them and this is due to some of the people not trying to help to achieve and not doing their job in a proper way".

Moreover, in addition to communication problems, Respondent no. 19 adds that the *commitment of top management* regarding critical issues is also a challenge. He says:

> "The main challenges are there in poor communication with other colleagues or bosses and also the low level of commitment of top management towards critical issues needs fast and immediate action".

Others respondents - around thirty seven percent - have different opinions regarding the challenges. For example, Respondent no. 22 talks about the *duration* of executing the projects not being sufficient:

> "The challenges in my job are limited to the achieving of the target dates, which sometimes you feel are impossible".

Also, few respondents show that the *increase in materials and labour costs is frequently* one of the challenges which they face. For example Respondent no. 24 says:

> "Since my job is to control the budget of projects, I have faced some problems in fixing the costs for projects of long duration because the prices of materials and labour costs can increase dramatically."

Analysis:

In Qatar and most Arabian Gulf regions, there has generally been a shortage of skilled people in the construction industry. This shortage consequently affects the quality of work in general. The workers are the main challenge faced by the construction industry, and this is a result of the difference in cultures and the ensuing communication problems. Language is one of the most critical barriers in construction companies causing misunderstanding with respect to instructions and responses between labourers and supervisors. Moreover, the researcher observed that employees are afraid to complain or even dare to suggest anything to upper managers and this is due to the fact that most labourers are from poor countries and fear of loss their job. In general, the interviews put great emphasis on the variety of cultures in the construction companies in Qatar as one of the obstacles to the implementation of TQM.

5.3.8 Implementation of Quality in Different Countries

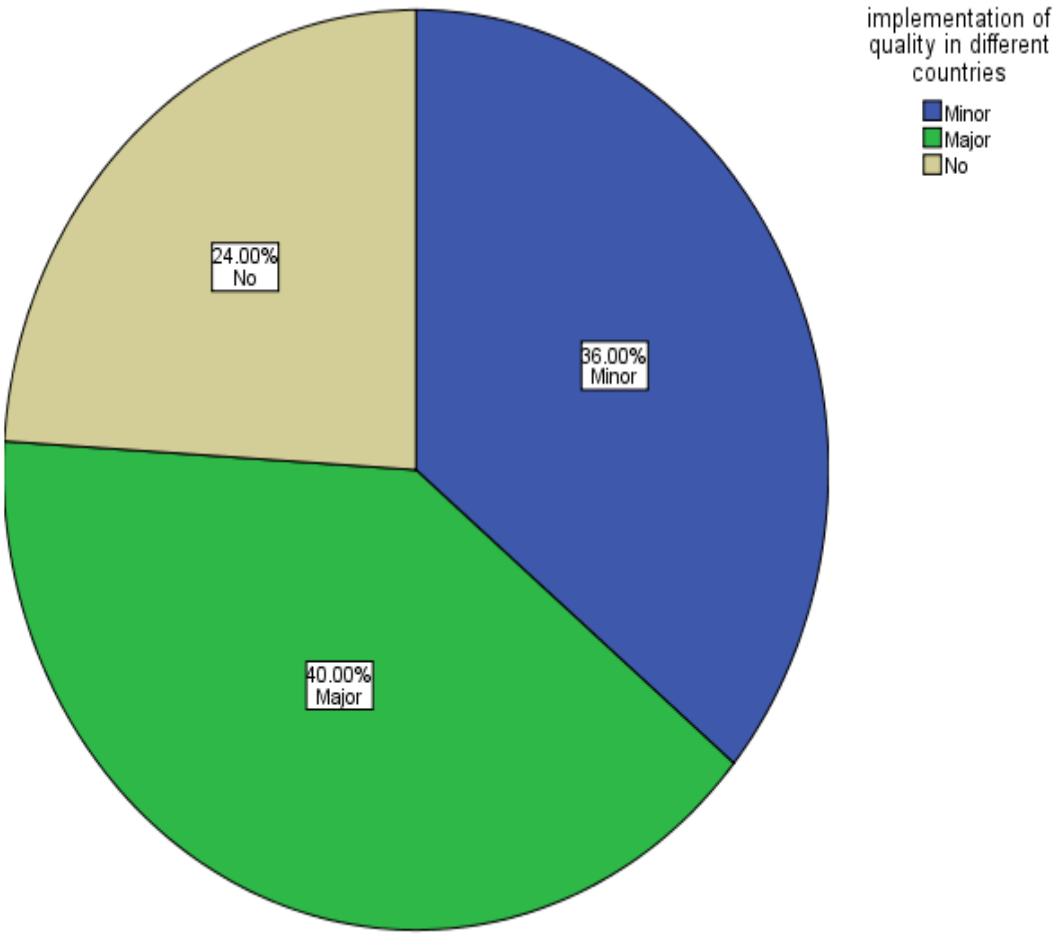


Figure (5.9): The Difference in Quality Implementation

The purpose of this part is to determine whether the implantation of quality in the State of Qatar is different from that in other countries. The respondents to this question are differing in to three opinions as shown in Figure (5.9); the majority of them - almost forty percent - said there are *major* differences in the implementation of quality in their countries and in Qatar. Respondent no. 4 says:

> "For me, our present company needs a lot of improvement in terms of quality. I have worked before locally in the Philippines and I still find the work there has more quality in terms of company procedures and systems".

Respondent no.19 adds that the lack in quality implementation in Qatar is due to the *difference in the cultures* of the people:

> "Yes I have found that quality in this country needs some changes and more understanding of the concept, so different cultures in this country make the implementation of quality or the adoption of such a system becomes more difficult".

On the other hand, some respondents have different opinions as Respondent no. 12 said:

> "In this country, there is a high level of good quality and a perfect standard of rules that sets attitudes in the right direction which is very different from the standard rates in my country".

Also, Respondent no. 25 reveals that more issues relate to quality implementation such as *mixed nationality and teamwork***,** as he says:

> "Owing to mixed nationality working in one organisation, different values emerged that led to miscommunications. Mind setting towards the effective implementation of an integrated management system, including trust and teamwork, is what differs from the country I worked with."

Some of the respondents - around thirty six percent - said there are *minor* differences between their countries and Qatar, as Respondent no.21 says:

> "The implementation of a quality process in my country and in Qatar is almost the same, but the difference may be in the culture of people, since in my country we deal with limited cultures, but in Qatar there are more and different cultures."

Also, Respondent no.2 confirms this and says:

> "Since I'm new to this place, I cannot find any difference in quality compared to my country. But in India they have quality standards. These depend on the industries."

In addition Respondent no. 3 mentions that quality in Qatar is more *encouraged by the government in his own country***,** as he says:

> "The implementation of quality in Qatar is more encouraged by the government and has become a requirement in all government projects."

Twenty four percent of the respondents *did not find any difference* in the implementation of quality in their country and Qatar, as Respondent no. 26 said:

> "In the era of globalisation quality in the construction industry depends upon the client/ consultant of the project. In my opinion, the implementation of quality in Qatar is as good as India, because world class reputed consultants are involved in the construction industry. On the other hand, the availability of resources in the country is another reason that quality can be met"

Also, Respondent no. 14 emphasises on this when he says:

> "The attitude and implementation of quality in the industry have almost the same aspects and delivery of work in my country as in Qatar."

Analysis:

The implementation of quality in the State of Qatar is supported by the government, but different cultures and the mixed nationality of workers have led to quality implementation in Qatar facing more difficulties than other countries. The employment in construction companies in Qatar should understand the benefits of implementing such a quality system as well as its impact on all company activities.

5.3.9 Familiarities with TQM

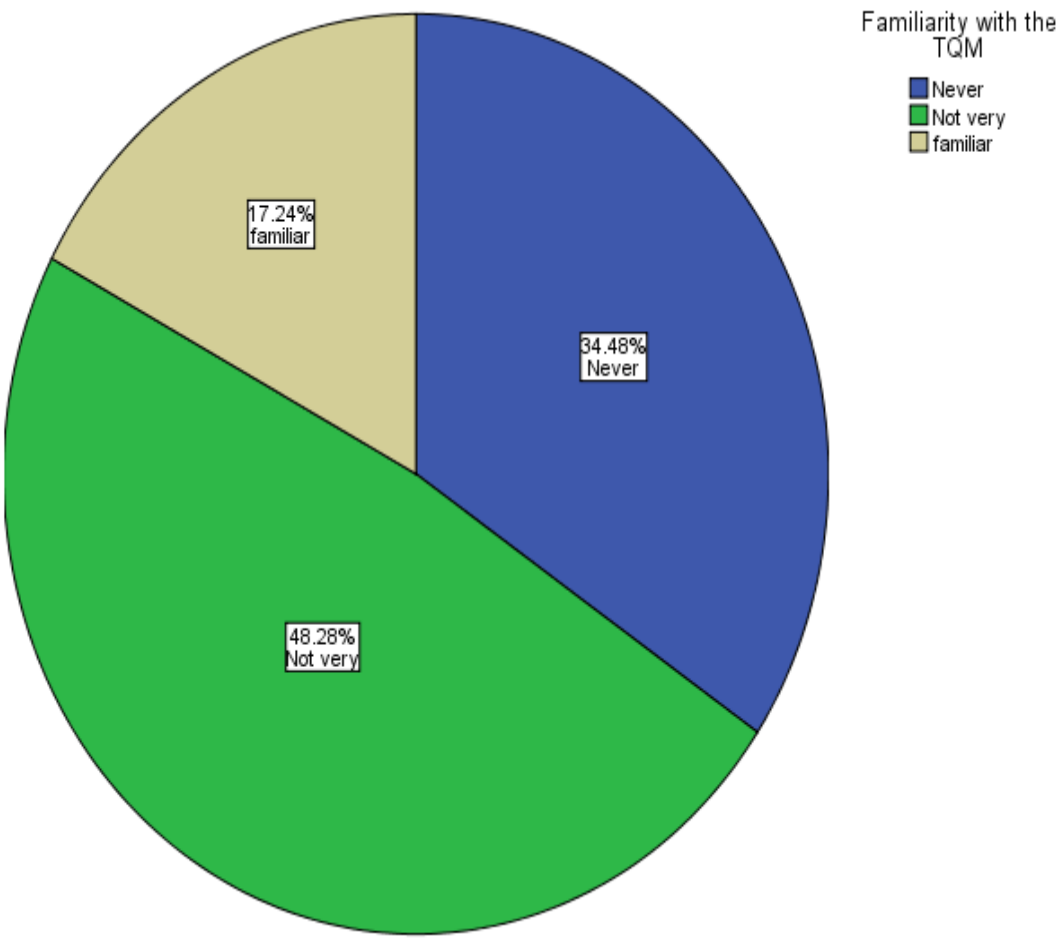


Figure (5.10): Familiarities with TQM

As in Figure (5.10), forty eight percent of the respondents had *heard* about the concept of TQM but they *had not implemented it,* and this was expected from the literature, showing that the concept of TQM is almost new and never totally implemented in the construction industry in Qatar. Consequently, some of them had heard about the concept from their academic studies, as Respondent no. 9 say:

> "I have some background from my previous academic studies, but still it's not clear for me."

Some of them have the basis and tried to explain it according to *their understanding* of the concept, as Respondent no. 4 says:

> "Not too much, but Total Quality Management for me is having a system that could use the maximum output of a certain company. Once implemented, this system and procedures must be monitored regularly in order to have a positive outcome."

Also, thirty five percent of the respondents had *never heard* about the concept of TQM, which was clear with the Respondent no. 2 when he said:

> "I don't know any thing about the TQM concept."

Several did not have any idea about the concept of TQM. For example, respondent no. 5 says:

> "I don't have any idea about TQM."

The remaining seventeen percent are *familiar* with TQM have good experience of it and its implementation. As respondent no. 19 said

> "Since 1995 I have studied and worked with it and know we can try to improve our knowledge by attending more seminars about TQM.

Respondent 14 described the TQM concept in a different way and he included other aspects as he says:

> "TQM is composed of 3 paradigms. Total, quality and management, TQM is a management approach for an organisation, centred on quality, based on the participation of all its members and aiming at long- term success through client satisfaction."

Also, Respondent no. 25 says:

> "TQM (Total Quality Management) is one of the quality tools that provide proper quality management that includes Quality Circle, 5S, or continual improvement

and other approaches for the effective implementation of a quality management system."

Analysis:

The results from the interviews show that the Total Quality Management (TQM) concept is almost unknown for the majority of employees among construction companies in Qatar. Even the experts who are working on the quality field failed to define the concept as it has been illustrated in the literature. The failure or inability to find a proper and precise definition of TQM indicated a lack in knowledge of the tools and techniques or features related to the concept of TQM. The awareness of the concept of TQM is a crucial stage in the implementation of the TQM programme.

5.3.10 Barriers to Continuous Improvement

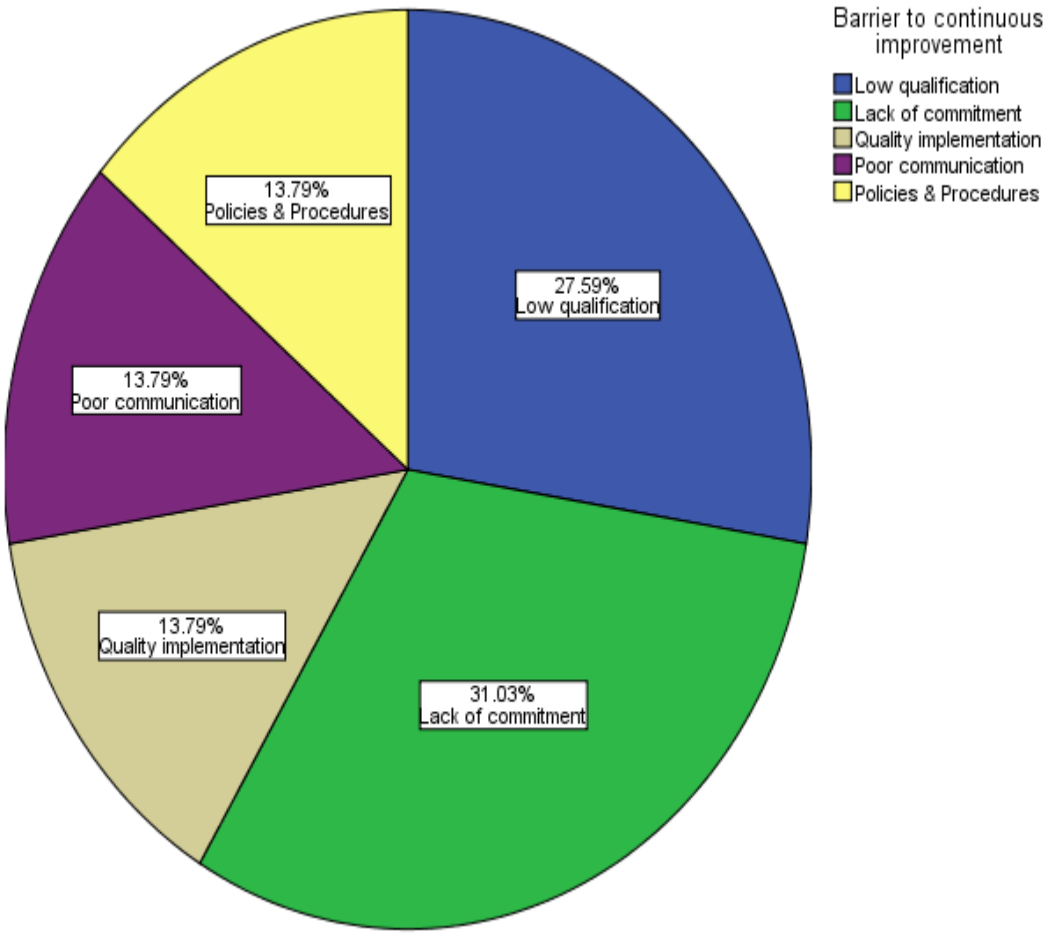


Figure (5.11): Barriers to Continuous Improvement

This section is about barriers to continuous improvement. As shown in Figure (5.11), the majority of the respondents - almost thirty one percent - decided that the *lack of commitment*, especially from top management, is a barrier to continuous improvement, as Respondent no.3 says:

> "The barrier to continuous improvement depends on all organisation, the willingness and commitments of everyone employed in the whole organisation"

This is also emphasised by Respondents no.19, and 29. Respondent no. 6 adds that commitment is needed not from top management only, but from all employees.

Some of the respondents - about twenty eight percent - agreed that the lack on *availability of qualified people* in the construction industry constitute the main barrier to continuous

improvement. For example, Respondent no. 11 mentioned the importance of *"low management skills to manage the organisation properly*" for continuous improvement. Also, Respondent no.22 says "shortage of people with skills", and respondent no. 26 adds the "leaving of experienced staff from the organisation" as a barrier to continuous improvement.

For fourteen percent of the respondents, their opinion is that the *lack attention to employees training in improving quality implementation in their activities* is the barrier for continuous improvement. For example, Respondent no.2, and Respondent no.5 and also, Respondent no.13 says:*" Not following the project quality plan"* is the barrier to continuous improvement.

A few of the respondents -about thirteen percent- talk about *communication.* As Respondent no. 8 said: "Communication gap between departments" is one of the barriers to continuous improvement, and Respondent no.19 mentioned there is "bad communication between employees"

Moreover, thirteen percent of the respondents mentioned that if the organisation looks for continuous improvement, company *policies and procedures* must be respected and followed by all employees. For example, Respondent no.7 says:

> "Some people do not follow company polices and procedures."

Also, respondent no.27 says that one of the important factors for lack of continuous improvement is the:

> "Improper inspection, monitoring and testing"

Analysis:

The core issue that distinguishes the philosophy of TQM from other quality system philosophies is a continuous improvement strategy, meaning that the improvement processes in any of the company's activities never ends. The barriers to continuous improvement extracted from the interviews are as follows:

- Low qualification of top management
- Unwillingness of employers to seek improvement
- Lack of attention given to employees' training for improving quality implementation regarding their activities
- Poor communication

The qualification of the top management includes their level of degree and the quality of training they hold. The high qualification of employees in general leads to the understanding and development of the continuous improvement strategy. The researcher observed that some employees dislike and are in fact unwilling to seek any kind of improvement as they thought that such improvement means changes in their activities or positions. The adoption of a continuous improvement strategy needs a successful implementation of the quality system and then proceeding to further improve it. The improvement of the communication between employees and departments is essential to the successful adoption of the continuous improvement strategy.

5.3.11 Evidence of Customer Satisfaction

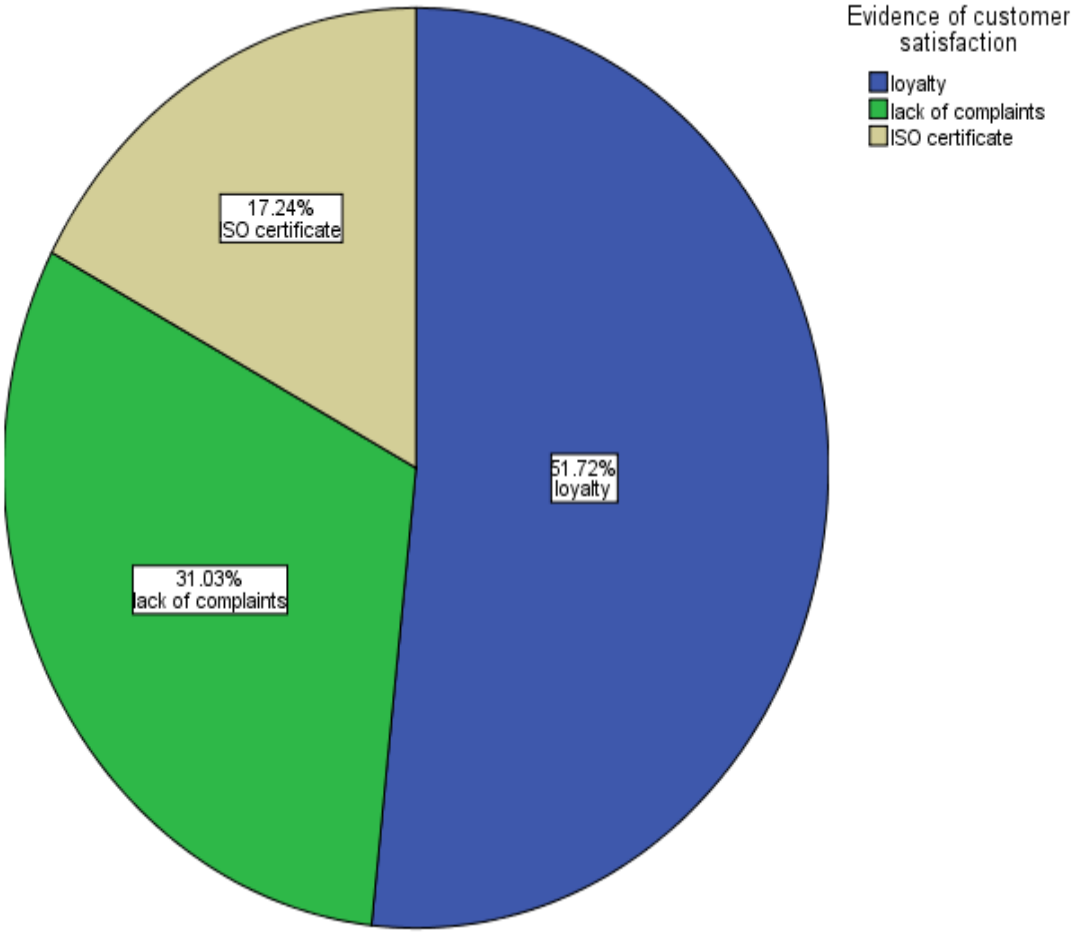


Figure (5.12): Evidence of Customer Satisfaction

The aim of this part is to describe the evidence of what the construction industry is capable of in meeting the customer requirements and expectations. Figure (5.12) described that the majority of respondents - about fifty two percent focus on *loyalty* from the customers as the evidence that their requirements are met from past relationships. For example this evidence is discussed by the Respondent no. 1, as he says:

> "Prioritisation in given work for the company by the same customers is the evidence the company met their requirements in previous relations".

Also, Respondent no.12 agreed with the above when he said:

> "When we repeat a new project with the same customer, that means we met his requirements."

Respondent no. 28 stressed this evidence by saying:

> "Repeating jobs with the same customers is the evidence that they are happy with us."

In addition, thirty one percent showed that the *lack of complaints* from customers is further evidence for their satisfaction. Respondent no.18 explained this by saying:

> "Fewer complaints from customers is the evidence their requirements are met."

Moreover, Respondent no. 11 agreed this and says:

> "We didn't receive any complaints from them."

Some opinions - almost seventeen percent - from the respondents mentioned that owning the *ISO certificate* is the evidence of achieving successful results of successful in meeting customer requirements, as Respondent no. 3 says:

> "The ISO certificate we got is the result of many successful steps we took and meeting customer requirements is one of these steps."

Also, Respondent no. 7 agreed with the above evidence when he said:

> "The fact that the Company got an ISO certificate could be good evidence."

Analysis:

According to the literature review, the achievement of customer satisfaction is one of the important aims of TQM and is also one of the critical success factors for TQM implementation in the construction industry. The interviews showed that customer satisfaction can be measured by the level of loyalty between the construction company and its customers. Less complaining from customers suggests that their requirements are met. Also, having such quality certificate is considered as evidence that a company has satisfied its customers. On the other hand the respondents show that they are working to satisfy their customers, but a lack of understanding the true meaning and aims of TQM leads respondents to turning away in examples given of customer satisfaction as mentioned in literatures, such as focusing on process improvement, relationship confidence, dialogue, teamwork, and education.

5.3.1 Factors Impacting on Quality in the Construction Industry in Qatar

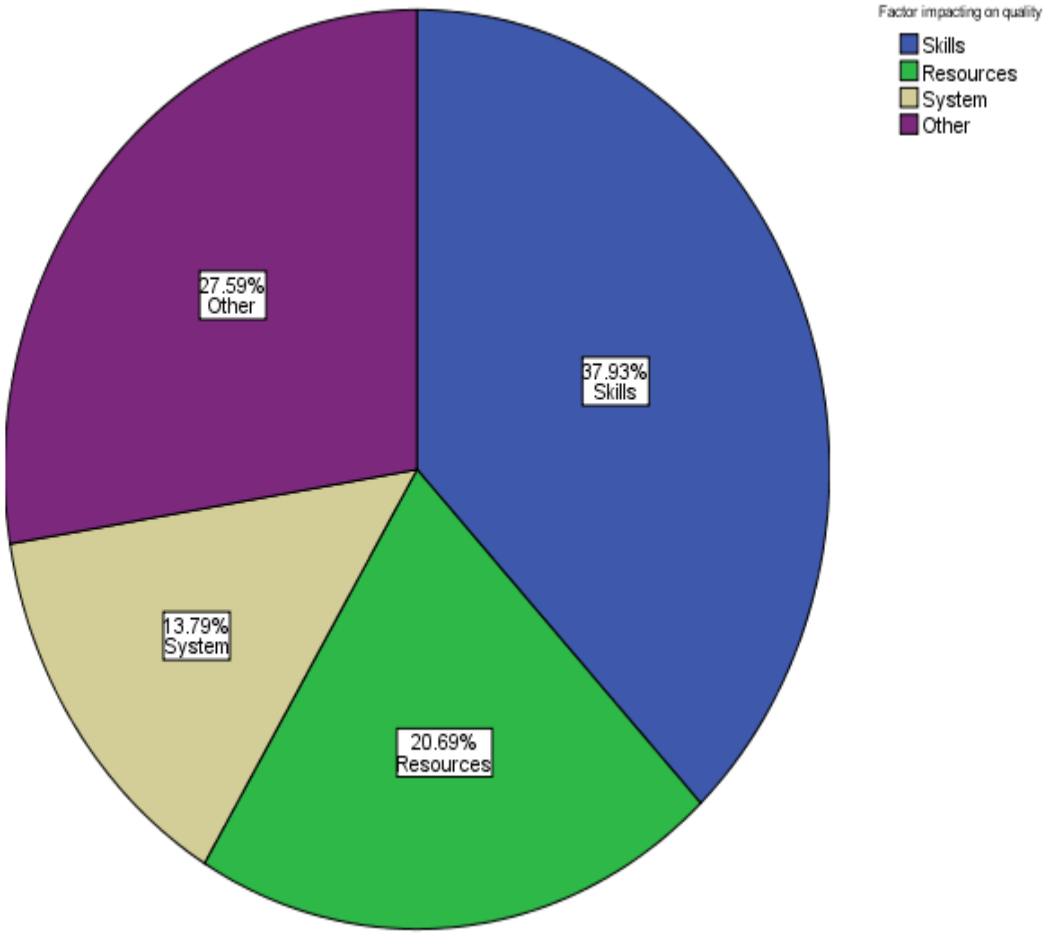


Figure (5.13): Factors Impacting on Quality in the Construction Industry in Qatar

This section is about the factors that impact on quality in the construction industry. As shown in Figure (5.13), the responses to this question were focused mainly on three factors: *Skills, Resources, and System.* Thirty eight percent of the respondents said that the *skills of the employees and workers* have an impact on quality in the construction industry. For example, Respondent no. 5 says:

"The main factors are bad workmanship and bad projects management."

Also, Respondent no. 16 emphasised on this when he said:

"There is a shortage in skilled employees and workers."

Almost twenty one percent of the respondents agreed that the *availability and quality of the resources* have an impact on quality in the construction industry, as Respondent no. 10 says:

> "Lack of availability of resources forces contractors to use alternatives which in time results in poor quality."

This was clarified by the Respondent no. 28 when he says:

> "Good quality of materials, and equipments used"

The third factor that has an impact on quality in the construction industry is the *proper system* adopted to manage the construction company, and that was the opinion of fourteen percent of the respondents. For example respondent no. 13 says:

> "The implementation of proper quality management system such as ISO 9000 has an impact on quality in the construction industry."

Also, Respondent no. 19 explained this in more detail and he added more aspects related to a proper system such as *procedures, commitment, and communication* when he said:

> "In general, one of the important factors which have an impact on the construction industry in Qatar is the real application of the procedures which are mentioned in the ISO file in practice not only in theory. Procedures are adopted by the company aspects of TQM, committed to a team who hold it in mission, vision and company polices. I can therefore say the commitments that are followed up with correct actions and proper communications between different levels of people are important factors that have an impact on quality."

In addition to the existence of a proper system, the right method of *implementation* of that system is more of great importance as Respondent no. 27 lists the factors in two points:

- "Proper system

- Proper way of implementation a suitable quality system."

Other respondents - around twenty eight percent are different in explaining the factors that impact on quality in the construction industry. For example, Respondent no. 1 finds that the *competition* from foreign construction companies could impact on local construction companies. He says:

> "The competition of the local market with foreign markets has a strong impact on the industry because to be a competitor to the international construction companies, your quality has to be better or at least similar to their quality."

Respondent no.14 discusses the *climate* issue as a factor and says:

> "The main factor in my opinion is the climate, since there are more than five months with high temperatures (almost reaching to 50 Cº)."

Also, Respondent no. 8 talks about the *mixed nationality* when he says:

> "In my opinion, mixed nationality and discrimination are the main factors impacting on quality in the construction industry."

The *duration* of executing the project is not enough and could have an effect on the quality. This issue is discussed by Respondent no. 26, who says:

> "Insufficient duration is allocated for project execution."

Respondent no. 14 clarifies that the respect for the duration of projects is the responsibility of all employees in the organisation. As respondent 14 says:

> "The evidence is there, in the Quality of work and the ending of the projects within given time frame."

Another view from Respondent no.20 is to emphasise the duration of the project whatever the losses are by saying:

"Finishing the project on time is essential even it costs company more."

Moreover, a few of the respondents, mentioned that the *controlling* of the progress of work has an impact on the Construction Company. For example, Respondent no. 22 says:

"The main factor is lack of control over the progress of the work"

Analysis:

The interview revealed that the main factors that have an impact on the construction companies in Qatar are:

- Low skills of workers or employees

The skills of employees are among the important factors that have an impact on the construction industry in Qatar. This fact emphasised what was found in McQuater et al. (1995) who considered the skills of employees as a one of the factors that could facilitate positive change and improvement. Moreover, according to the European Construction institution (July 1993), the skills of employees must be considered if the organisation is going to become a TQM company.

- Lack of availability of resources

The resources come in different forms such as financial, human and materials, so that the lack of any of these resources could lead to failure in any construction company business. Oakland (2006) believes that resources and procedures are to be directed towards ultimate excellence key performance results.

- Adoption of proper systems

As mentioned in the literature, finding the proper system to eliminate the causes of poor quality work has become more important than ever. Moreover, Feigenbaum defined Total

Quality Management as an effective system. Steven (1994) emphasises the importance of adopting a proper system to any successful implementation of the quality concept. Oakland (2006) proposed a TQM model that would keep the system as an important component. Also, gurus concerned about the organisation system such as Deming with his 14 points hope that the principle of TQM would "improve constantly and forever the system of production and service to improve quality and productivity".

5.4 Discussion

5.4.1 The Concept of TQM vis-à-vis Construction Companies

TQM focuses more on the system and customer and emphasises improvement and better utilization of the available resources in a more efficient and systematic manner. During the survey process, it became apparent that the main difference between quality and total quality management is that the quality term usually focuses on a temporary process, whereas TQM is a long term process that adopts a strategic dimension in order to guide each production, financial, marketing, and administrative plan in the direction which supports the same strategic dimension.

The interviews in Section (5.3.5) show that the employees in the client's construction company are familiar with the concept of quality and it is a very common term used within the organization. Some of the interviewees defined quality as excellence in the job while others related the concept to customer satisfaction. In general, most of the interviewees' definitions are related to the gurus' definition such as the Deming definition mentioned in Section (2.7.2). However, even though the concept of quality is frequently used within construction companies, it was observed that for the interviewees, quality issues focus more on the tangible processes such as the strength of the concrete and so forth.

Section (5.3.9) shows that most of the interviewees have never heard of the concept of TQM and even the people who are involved in and responsible for the development of quality management systems also failed to define the TQM concept as explained by quality gurus in Section (2.5.2). From the interviews in general, it was observed and established that the misunderstanding of the TQM concept can be owed to a lack in

commitment by the top management as mentioned by one of the interviewees in Section (5.3.7). As emphasised in the literature Section (4.9.1) and in the Cecilia study (2005), the commitment of top management is the key issue for any quality system

The above finding is emphasised in the study by Al-Khalifa and Aspinwall (2000), Section (2.13). They found that the awareness and understanding of the TQM concept was at a very low level and that the TQM critical success factors were not well-known and practiced in Qatar. However, in their study about the implementation of TQM in general, the interviewees in this research also agreed that the same situation occurred in the construction industry as well, which is evidence that most of the respondents did not know what TQM meant as in Section (5.3.9). There is a lack of understanding as to the main purposes of TQM, and confused with other quality concepts such as ISO. Consequently, it would seem a little difficult to incorporate with this new era of developments with out conscious understanding to the TQM concept.

During the survey processes, it was observed that some wise companies have decided to go for ISO in order to become only ISO certified. There are many benefits of having ISO, such as the focus on quality, the emphasis on how the work should be implemented, and the true categorization of many elements of it. Those companies that did not think about these benefits in the first place did not really understand that quality management is a serious business and considerable attention should be paid to such factors such as time and money to be spent. Therefore, as in Section (2.14), the diffusing an awareness of the importance of TQM's role in institutional development is an important stage for adopting and understanding the philosophy of TQM. To successfully understand the concept of TQM, spreading its awareness is important, especially in the earlier stages because every person in the organisation must learn the concept before it is applied.

5.4.2 The Requirements for Implementing TQM within the Construction Companies

As mentioned in Section (3.5.1), the emphasis is on the need for and importance of TQM in construction companies. Implementing TQM in construction companies means a comprehensive change to each and every aspect of the construction process. Some studies have established that the process of change is difficult because the construction industry has been historically reluctant to implement change. This fact was also emphasised in interviews with construction companies in Qatar, where it was observed that some of the employees disliked any kind of improvement and since they thought that the improvement means changes in their activities or positions.

Several studies such as Ramirez and Loney (1993), Bhimaraya (2005), and the European Construction Institution (July, 1993), discussed TQM's critical success factors as in Section (3.5.2), and some of these factors were common to most of these studies. Therefore, the discussion in this section is mainly focussed on some of the critical success factors which have an impact on construction companies in Qatar, such as management commitment, customer satisfaction, cultural change, education and training, and employee relations.

- **Management Commitment**

The main observation from the role of leadership in construction companies is a lack of commitment in the implementation of such a quality system. That observation emerged from the way the clients' company implemented their quality system as a bottom to top instead of a top to bottom system. As mentioned in the literature, Butler's study in (2007) as in Section (4.8.1), showed that leadership should be top-down and emphasises charisma as means to winning employees' admiration and increase satisfaction. This issue was discussed with the development manager in the clients' company and suggested that the reason is a lack of confidence in the leadership towards a quality system. Therefore, the quality program is first directed at the lower levels and only if it succeeds, then the leadership would become more committed towards supporting the quality program.

- **Culture change**

According to Hofstede (1991) in Section (4.9.2), culture is the collective programming of the mind which distinguishes one group from another. It is the sum total of beliefs, knowledge, attitudes of the mind, and customs, to which people are exposed during their social conditioning. The interviews conducted among construction companies in Qatar observed that changing an organisation's culture is a most difficult step in the implementation of TQM philosophy and this is due to the nature of the construction companies in Qatar which include a lot of people with a wide cultural range, which means different attitudes and mentalities.

- **Education and training**

The importance of education and training in the adoption of a quality system has been reported in many studies. For example, Deming emphasises the importance of training in the job which is considered one of Deming's 14 points regarding TQM principles as in Section (2.7.2). For Ishikawa (1985), "Quality begins and ends with training", as in Section (4.8.3), while Kano (1993) stresses the importance of adapting training programmes to the company's workplace.

Manpower in construction companies includes all the people involved in a project such as engineers, foremen, and labourers. Even though the interviews show that the clients' company has a training coordinator who has responsibility to coordinate and facilitate the training of employees as mentioned in Section (5.3.1), the interviews also, show as in Section (5.3.1) that most employees in client's construction company are technical people with little experience. Training of people planned or received was not clearly described during the interview sessions, which may give the impression that training procedure did not exist or were not properly subscribed. According to Zairi (2006), as in Section (4.8.3), investment in training is at a high level for companies integrating or linking business results and people management. Therefore, the conclusion is that the client's construction company needs to invest more in training which in turn has a positive impact when it comes to the implementation of TQM.

- **Employee relations**

As in Section (2.7.2), one of Deming's 14 points for TQM principles is breaking down barriers between departments. Deming's emphasis that work ought to be as a team and not as a department implies that people cannot work as a team without building good relationship with others in the organisation. The interviews as in section (5.3.4) clarify that the relationships between employees in client's construction company are good. The conclusion that there is a positive relationship among employees is a positive sign for the implementation of the TQM philosophy.

5.4.3 The Present Situation of the Construction Companies in Qatar.

The construction companies in Qatar are classified according to certain criteria as presented in Appendix (A). The classification shows that most of the construction companies in Qatar are small-to-medium companies, and few are considered large companies, but with today's progress and the development of the country's economy, the need for change has become more and more necessary. Therefore, small companies have grown into medium-sized companies and medium-sized companies have grown or upgraded themselves into large companies.

It was extracted during the survey processes in Section (3.8) that there are some issues that concerned clients and construction companies as well, but from different points of view. These issues are the cost, quality of work, and the delay in the completion of projects. The literature review (Seymour and Low, 1990), as emphasised in Section (1.1), stated that many management writers and thinkers have continuously strived for better methods of achieving time, cost-effective and quality objectives. The interviews conducted as in Section (5.3), employed a qualitative methodology to understand the situation among construction companies in Qatar. Therefore, the question to the interviewees was: "What challenges do you face in your job that is specific to the construction industry alone". The interviewees as in Section (5.3) emphasise previous issues and add that the issue of workers is considered a major issue.

The past view of quality is that "increased quality will increase project costs", while today's view is that "improved quality saves money and increases business" as mentioned in Table (2.1). The cost issue arises due to the fixed contractual amount during the duration of construction and to changes in the prices of materials. This issue does not exist in the UK construction industry as mentioned in Section (3.9) due to the availability of many suppliers for construction materials. Therefore, the Government in the state of Qatar should encourage building material suppliers to establish more shops by providing more facilities and remove any obstacle against the expansions of suppliers. It should also encourage foreign companies to come to Qatar and to focus their investments in the building material business.

It was observed from the interviews that the quality issue discussed above basically referred to the shortage of workmanships skills which in turn led to poor quality and unclear quality standards, so that each consultant proposed his own specifications. In contrast there is in the UK a quality standard and all large construction companies follow this standard, as mentioned in Section (3.9). Therefore, the attention to the import of skilled labourers and the existing master quality standards are important for overcoming these issues.

As mentioned in the literature Section (3.9), most of the projects in Qatar are only completed after the agreed time; this issue is global and not limited to Qatar. In the UK this typical problem exists. The interviews in section (5.3.12) referred this issue to the inadequate duration for executing the project. Therefore, the durations of projects must be long enough to be commensurate with the size and importance of these projects.

The government in Qatar, as the authoritative body, classified construction companies according to certain criteria, aiming to improve and generate the spirit of competition among construction companies, as shown in Appendix (B). Moreover, construction companies in Qatar believe in and agreed with the importance of improvement in order to gain a competitive advantage. It was observed from the classification criteria, that the measurement or assessment of quality is based on the availability of quality management only in company structure. Therefore, to exceed the value of quality and encourage construction companies in Qatar to increase their interest in the quality concept, the

assessment for quality should be based on quality principles and upon measurement of the level and reality of the implementation of these principles.

5.4.4 The Critical Problems Faced by Construction Companies in the State of Qatar vis-à-vis the Implementation of TQM.

Due to a lack of literatures relating to the implementation of the TQM philosophy in Qatari construction companies and in an effort to better understand the situation there, the interviews were conducted with people involved in those construction companies, while qualitative approach was used for the analysis. Section (3.8) listed some of the challenges or barriers facing the construction industry in the implementation of TQM among construction companies.

The interviews indicated that some of these barriers do not exist within the client construction company, such as fear of job losses or perceived threat to the foreman and project manager roles. Some of the barriers are shared, as mentioned in the literature in Section (3.8), such as the quality, culture, communication, and commitment. Some of these problems are limited to construction companies in Qatar although not mentioned in the literature due to the nature of the business environment in the construction industry there, such as the duration of the projects and fluctuations of prices.

Even though the literature review Section (2.9.2.3) emphasises the importance of culture, communication, and commitment which are considered the foundations of the TQM framework, at the same time, the interviews also considered the challenges facing construction companies in Qatar. Therefore, each of these challenges will now be discussed in detail:

- Commitment

Management commitment is the second stage in the implementation of TQM program as mentioned in Section (2.14). Also, most of the literature indicated that the commitment is one of the most important critical successful factors in the implementation of TQM, as in Section (3.5.2). Moreover, the emphasis on the commitment of top management and their responsibility, as in Section (3.5.2), clarifies that the concept of commitment is workable

in any location within the company. For example, at work sites, the top manager may be the foreman, but in the office, the top manager may be the department manager or director. Therefore, understanding and measuring the level of commitment and responsibility in Qatar's construction companies is essential for the implementation of TQM.

It emerged from the interviews, Section (5.3.10), that the respondents in client's construction company considered the poor commitment of top management as a challenge they faced and a barrier against continuous improvement. At the same time, they believe that such commitment should not be limited to the top management only, but everyone in the organisation, all of whom ought to be committed to the implementation of TQM principles. To emphasise what was found from the interviews, the questionnaires were designed to cover some statements related to the top management's level of commitment, as in Section (4.8.1). It established that the respondents in client's construction company understood fairly well the importance of top management commitment, which has a positive impact on the adoption of the TQM programme.

- Culture

The interviewees in Section (5.3) did not clarify the exact problem with culture in the implementation of the TQM. Therefore, the questionnaires survey also included a culture element and a quantitative approach, implemented to achieve a better understanding of the cultural problem. The discussion of the culture element is presented in section (7.6.11).

- Communication

The interviews as in Section (5.3.4) show that the client's construction company believe that the proper communications between different levels of people are important factors that have an impact on quality. Since most of the workers in construction companies in Qatar are foreigners language is the main obstacle to improving the communication between workers themselves from one side, and with their bosses on the other. The questionnaires emphasises what was found from the interviews, which revealed that the

client's construction company see proper communication as essential to achieving total quality management. Therefore, they are encouraging good communications with their suppliers and customers.

5.5 Summary

This chapter has presented the results of the interviews, which was conducted during this study. The qualitative results demonstrated and reported the situation of the construction companies in Qatar and identify the concept of TQM from different angels. Table (5.2) summarised the main theme extracted from the qualitative results and the detailed recommendations are outlined in chapter 9.

Table (5.2): Summary of the Main Themes Extracted from the Qualitative Results

S	Main Theme	Description
1	Organisational Structure	The organisational structure of the company described in the official documents is not implemented in reality and it may be case across the construction companies in Qatar.
2	Employees Nationality	Qatari nationals working in construction companies are not working in lower management or labourer sections, most of the people, if not all, employed at these levels are foreign nationals.
3	Employee Recruitment	Although, the preferred method used in the state of Qatar to recruit new employees is via recruitment agencies, but other methods are also used for the recruitment of staff and a broad variation in the process exists.
4	Informal Relationships	There are good positive relationships between the management (employer) and the employees exist and it was more apparent among those from the similar culture and background.
5	Concept of Quality	The concept of quality is well understood terminology within the employees in the company and staffs are well aware of the effect of quality on the outcome of the company's profile and annual profits.

6	Lack of Monitoring	Lack of monitoring of the standard operating procedures and the bureaucratic processes are the main problems relating to the quality issues, which act as a barrier at a number of stages and there is a need to streamline these processes.
7	Cultural Barriers	Cultural barriers do exist in the company, as variety of cultures do exist and very often become a barrier / obstacle in the implementation of TQM.
8	TQM Concept	The Total Quality Management (TQM) concept is almost unknown for the majority of employees among the company.
9	Top Management Structure and their skills	Top management structure requires overhauling, as top management is very often not qualified to understand the exact processes, which is due to lower qualification. Unwillingness of employees to seek improvement, lack of attention given to details, training for improving quality implementation regarding their activities and poor communication are the main barriers towards continuous improvement.
10	Unskilled Workers, lack of availability of resources and adoption of proper systems	Unskilled workers, lack of availability of resources and adoption of proper systems are some of the main factors that have an impact to the continuous improvement cycle and in additions, these factors can adversely affect the progression and products of the company, which will have an impact on the profitability of the company.

In general, it can be stated that the lack of understanding of TQM within the company is a major issue, which dictates that there is a need to run training programme for the staff(S) at all levels within the company. The quantitative results emphasise on what was found from the interviews and indicated that the company has a solid foundation that might be used as an introduction to the implementation of TQM framework. Moreover, it addresses the effectiveness of total quality management as a solution to the areas that need to improve. Finally, some of the finding will be used as recommendations of this study and presented in Chapter 8.

Chapter 6: Survey Results and Analysis (Quantitative)

6.1 Introduction

The aim of this chapter is to discuss and present the results of the questionnaires survey conducted with the employees who are working on the client's construction company. The questionnaires distributed to the employees after the permission from the director of the company. Section 6.2 presents the results from quantitative methods. Section 6.3 described the results obtained from Chi Square Test. Section 6.4 is the summary of the chapter.

6.2 Results from Quantitative Methods

The results of the questionnaires are a complementary part for the finding from the qualitative interviews. After applying and analyzing statistically, the results of the questionnaires are described in the following tables:

Part (1): This part described the personal and experience background of the employees who work in the construction field and included the following independent variables: experience, background and number of training participated.

Table 6.1: The Research Sample Based on the Experience Variable

Years of experience	Frequency	Percentage (%)	Cumulative Percent (%)
Less than 5 years	21	65.6	65.6
5-10 years	9	28.1	93.8
11-15	2	6.3	100
Total	32	100	

From Table (6.1), it is very clear that most of the employees in client's construction company in Qatar depend basically on people with little experience (65% with less than 5 years experience) and this is due to the company's policy of attracting more employees who only seek a lower salary and working with expert employees as assistants for daily activities. This emphasis was observed by the researcher, in that client's construction

company focus on recruiting the less experience and recently graduated employees, as mentioned in Section (5.3.3).

Table 6.2: The Research Sample Based on the Background Variable

Background	Frequency	Percentage (%)	Cumulative Percent (%)
Secondary school	----------	----------	----------
Bachelor degree	30	93.8	93.8
Master degree	2	6.3	100
PhD	----------	----------	
Total	32	100	

Up to 94% of respondents hold a Bachelor's degree and it was clear some of them holding a Master degree (more than 6%) owning to better position in their career.

Table 6.3: The Number of Training Participated in Construction Companies

Number of training	Frequency	Percentage (%)	Cumulative Percent (%)
One	14	43.8	43.8
Two	6	18.8	62.5
Three	5	15.6	78.1
More than three	7	21.9	100
Total	32	100	

Table (6.3) shows that majority of the responses (around 44 %) hold one training session and few of them attend more than three training courses about 22% and this emphasizes the need for more training sessions to be participating.

Part (2): Part two is the questionnaires elements

This part included 55 statements distributed equally of 5 statements for each element. EFQM has 9 elements i.e. Leadership, People management, Policy & Strategy, Resources, Processes, People Satisfaction, Customer Satisfaction, Impact on Society, Business Results, in addition to the Continuous improvement and Culture element.

To test the above variables of the questionnaire, the responses are rated on five points scales. Scale (5) is strongly disagree and Scale (1) is strongly agree. The draft of the questionnaires were presented to the expertise in academic field, to asses the clarity and comprehensiveness of each statement and how it relates to the elements that need to be measured.

Cronbach's Alpha and Spearman-Brown Coefficients were calculated to measure the reliability of each element.

Table 6.4: Reliability Coefficient for the Variables

Elements	Sample size	Cronbach's alpha Coefficient	Spearman- Brown Coefficient
Leadership	32	0.95	0.97
People management	32	0.93	0.96
Policy& Strategy	32	0.94	0.94
Partnerships and Resources	32	0.96	0.95
Processes	32	0.97	0.96
People satisfaction	32	0.96	0.97
Customer satisfaction	32	0.92	0.95
Impact on society	32	0.90	0.89
Business results	32	0.96	0.95
Continuous improvement	32	0.97	0.94
Culture	32	0.91	0.87

As shown in Table (6.4), the values of Cronbach's Alpha and Spearman-Brown coefficient are more than (0.9) and indicated the reliability of the scale used. The value of Cronbach's alpha more than 0.7 is the indication of the reliability of the instrument. It is clear that a high reliability coefficient supports the validity of the questionnaires.

6.3 The Results from Chi- Square Test

The questionnaire was ranked in a 5- point scale: scale (1) was strongly agree, scale (2) was agree, scale (3) was neutral, scale (4) was disagree, and scale (5) was strongly disagree. All statements are asked in the form of questionnaires and the results obtained are tabulated in tables (6.5 to 6.15). Statistical analysis was carried out according to the procedure described in chapter (4). If the calculations indicated that the value of the Chi Square in tables (6.5 to 6.15) is more than the critical value of Chi-Square at 1% probability level then there is statistically significant difference among the responses to the mean value for that statement. If the calculation indicated that the value of the Chi Square in tables (6.5 to 6.15) is less than the critical value of Chi Square of the 1% probability level, then there is no statistically significant difference among the responses to that statement.

6.3.1 Leadership

The leadership statements are based on the main principles discussed in the literature review as in Section (4.8.1) and listed in Table (6.5).

Table (6.5): Descriptive Statistics: The Leadership's Statements Descending Listed According to Means

S	Statements	Mean	Standard Deviation	Chi-Square Obtained	Chi-Square Critical
1	Management structure based on effective process management exists.	2.1250	1.15703	14.563*	13.28
2	Our management encouraging communications with the suppliers and customers.	2.0937	1.14608	14.563*	13.28
3	Participate with the employees in decision-making.	2.0625	1.04534	15.813*	13.28
4	Provide a proper system for employees to increase productivity.	1.8750	1.21150	28.312*	13.28
5	Working to develop and continuously improve the company processes	1.5625	.71561	9.250**	9.21

* Based on the statistical significance is (0.01) and the degree of freedom is (4).

** Base on the statistical significance is (0.01) and the degree of freedom is (2).

The questionnaire results for the leadership statements which are tabulated in Table (6.5) indicated the following:

- Management structure based on effective process management is an integral part of the quality system. Therefore, it was essential to find out; "Does Management structure based on effective process management exists"? The mean value was (2.125) which is located within the range of agree response. These results emphasise that the client construction company puts significant emphasis on its quality system. Moreover, the management structure, based on effective process management, is very well embedded within the quality system. This also suggests that the leadership (management responsible for the implementation of quality procedures) is committed to effective process management.

- The effective communications and participation of the employees, is the evidence of the level of empowerment that provided by the leadership to their employees. Therefore, the statement was asked in the form of questionnaire, "our management encouraging communications with the suppliers and customers". The mean value was (2.0937) which is within the range of agree response. These acquired results show that the client construction company put significant emphasis on employee-empowerment which is one of the effective leadership characteristics. This also indicates that the leadership understood the importance of keeping employees close to suppliers and customers which in turn has had an impact on the implementation of TQM philosophy.

- One of the important characteristic of the leadership who involve subordinates in decisions making to set their priorities and goals as mentioned by Jeroen, (2007) in section (4.8.1). Therefore, it was essential to find out whether "managers participate with the employees in decision-making". The mean value was (2.0625) which is within the range of agree response. Therefore, there was a statistically significant difference among the "agree" responses to the statement: "mangers participate with the employees in decision- making". These results also show that client's construction company put pressure on managers letting subordinates play a role in

decisions-making. In other words, managers are seen as making decision only after consulting with subordinates, which in turn has a positive impact on the implementation of the total quality management program.

- According to EFQM (1999), as in section (4.8.1), emphasis that the leaders should personally involved in ensuring the organisation's management system is developed, implemented & continuously improved. The statement was the top management "provide a proper system for employees to increase productivity". The mean value was (1.875) which is located closest to the agree response. Therefore, there was statistically significant difference among the "agree" responses to the statement: "management provide a proper system for employees to increase their productivity". These results indicate that the top management of client's construction company put significant emphasis on the development and implementation of a proper management system that might increase employees' productivity, which in turn has a positive impact on the implementation of TQM philosophy.

- The literature in section (4.8.1), (Zairi study in 1994), identifies "leadership" as one of the critical success factors for sustaining continuous improvement in any organisation. Therefore, it was essential to find out whether: "the management working to develop and continuously improve the company processes". The mean value was (1.5625) which is located within the range of agree response. Therefore, there was statistically significant difference among the "agree" responses to the statement: "the management working to develop and continuously improve the company processes". These results point to the client construction company putting significantly emphasis on quality systems and company processes based on development and continuous improvement via effective management.

Conclusion:

The questionnaires survey was designed to cover the main issues related to the role of leadership principles as listed in table (6.5). The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.1). The overall mean average obtained for the leadership statements is (1.8) and this average is located within the range corresponding to "agree". The obtained results indicated that the employees in client's construction company are mature for the role of leadership, which was emphasised through questionnaires statements. Therefore, it may be concluded that the leadership element is effectively realized and understood, which in turn has a positive impact on the implementation of the TQM philosophy among the client's construction company.

6.3.2 Policy and Strategy

The policy and strategy statements are based on the main principles discussed in the literature review as in Section (4.8.2) and listed in Table (6.6).

Table 6.6: Descriptive statistics: The Policy and Strategy Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi-Square (Obtained)	Chi-Square (Critical)
1	The concept of total quality reflected in the Company's values, vision, and mission	2.1563	1.19432	6.750*	11.34
2	Company policy and strategy are managed and reviewed on a regular basis.	2.1250	.90696	9.750*	11.34
3	Necessary resources available for achieving the company's policy and strategy	2.1250	.90696	18.938**	13.28
4	Company policy and strategy can be modified according to business results	1.9687	.99950	12.250*	11.34
5	The concept of total quality embraced in the company strategy	1.9062	.81752	12.250*	11.34

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the policy and strategy statements which are tabulated in table (6.6) indicated the following:

- The term of total quality is essential to the organisation's values, vision, and mission, in line with any TQM organisation. Therefore, it was essential to find out: "is the concept of total quality reflected in the company's values, vision, and mission?" As in table (6.6), there was no statistically significant difference among

the responses to this statement. These results indicate that there is a convergence between the occurrences of the responses from the employees of client's construction company regarding this statement.

- The quality program is based on policy and strategy and these are regularly updated and improved. Therefore, it was essential to establish "are the company policy and strategy managed and reviewed on a regular basis?" From table (6.6), there was no statistically significant difference among the responses to this statement. These results indicate that there is a convergence between the occurrences of the responses from the employees of client's construction company regarding this statement.

- Deploying the organisation's policy and strategy needs the adequate and committed availability of resources to ensure the accomplishment of the goals and objectives. Therefore, it was essential to establish "are the necessary resources available for achieving the company's policy and strategy?" The mean value was (2.125) which is within the range of the agree response. As in table (6.6) there was a statistically significant difference among the "agree" response to this statement. The results obtained show that the client construction company puts significant emphasis on the importance of the availability of resources for achieving company policy and strategy. This also implies that resources never form an obstacle for implementing company policy and strategy, which in turn has a positive impact on the implementation of the total quality management philosophy.

- The successful business results reflect that the policy and strategy are implemented in the right way. This needs the daily control of business results as well as modifying the policy and strategy according to the business results. Therefore, it was essential to find out: "can the company policy and strategy be modified according to business results?" The mean value was (1.9687) which is well within the range of the agree response. As in table (6.6) there was a statistically significant difference among "agree" response to this statement. The results indicate that client's construction company puts significant emphasis on quality systems and business results based on effective and flexible policy and strategy, which in turn has a positive impact on the implementation of total quality management.

- The concept of total quality is the basis for the policy and strategy of the organisation that tends to adopt a total quality management programme. Therefore, it was essential to find out: "is the concept of total quality embraced in the company strategy?" The mean value was (1.9062) which is within the range of the agree response. As in table (6.6) there was statistically significant difference among "agree" response to this statement. The results indicate that the client's construction company in Qatar emphasis that the total quality concept embraced in their strategy, which in turn has a positive impact on the implantation of total quality management philosophy.

Conclusion:

The questionnaires survey was designed to cover the main principles related to the policy and strategy concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.2). The overall mean average obtained for the policy and strategy statements is (2.056) and this average is located within the range corresponding to "agree". The obtained results indicated that employees in client construction company in Qatar are mature and that they understood the concept of policy and strategy, while employees have a good perception of most of policy and strategy statements, which in turn has a positive impact on the implementation of the total quality management philosophy.The results finding supported the Olian, and Rynes (1991) study as in section 4.8.2. They reported that successfully implementing TQM in any organisation requires the alignment of every member's efforts with the aim of the organization. The results also, emphasis the Zairi study in (1997) as mentioned in section 4.8.2, quality policy provides the context and launching platform for the implementation of TQM.

6.3.3 People Management

The people management statements are based on the main principles discussed in the literature review as in section (4.8.3) and listed in table (6.7).

Table 6.7: Descriptive Statistics: The People Management Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi-Square (obtained)	Chi-Square (critical)
1	The use of surveys to obtain the perceptions of employees	2.1875	1.09065	21.750**	13.28
2	Training are implemented according to the employees requirements	2.0625	1.07576	22.062**	13.28
3	Employees are participated in the development of the company vision	2.0000	1.13592	23.000**	13.28
4	Proper rewards system applied for employees	2.0000	1.07763	19.875**	13.28
5	The quality improvement teams are effective	2.0000	.91581	11.750*	11.34

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the people management statements which are tabulated in table (6.7) indicated the following:

- The survey allows employees to express their feelings about their job and their organisation confidentially without any pressure. Therefore, it was important to find out: “does the company use surveys to obtain the perceptions of employees?” The mean value was (2.1875) which is within the range of the agree response. As in table (6.7) there was a statistically significant difference among the “agree” response to this statement. The result indicated that the perception of employees is essential for adopting a successful quality system and construction companies in

Qatar emphasise that. The results also, indicate that the surveys could be the mean for the employees to express their level of satisfaction, which in turn allows the company to use the surveys output to measure and enhance their satisfaction.

- Training is one of the most important requirements for implementing TQM in construction companies as discussed in section (4.8.3). Therefore, it was essential to find out whether "training is implemented according to the employees' requirements". The mean value was (2.0625) which is within the range of the agree response. As in table (6.7) there was a statistically significant difference among the "agree" responses to this statement. These results show that client's construction company emphasis the importance of training their employees but it needs more emphasis on the number of training as mentioned in table (6.3). The amount of training is not enough, since increasing the investment in training programmes has a positive impact on the implementation of the TQM philosophy.

- The word total in TQM philosophy should include the participation of employees in the development of an organisation's vision and mission. Therefore, it was essential to find out whether "the employees participated in the development of the company's vision". The mean value was (2) which is within the range of agree response. As in table (6.7) there was a statistically significant difference among the "agree" response to this statement. The results shows that client's construction company put significant emphasis on the importance of employees' participation in the development of their vision, which on turn has a positive impact in the implementation of the TQM programme.

- Thiagarajan and Zairi (2006) say that rewards and recognition are some of the enablers which maximise employees' potential and involvement to become contributors to the company's journey towards quality. Therefore, it was essential to examine: "does the proper rewards system apply to employees?" The mean value was (2) which is within the range of agree response. As in table (6.7) there was a statistically significant difference among the "agree" responses to this statement. The results indicate that the client's construction company use a proper rewards

system for their employees by linking it to their productivity performance, which in turn has a positive impact on the implementation of TQM philosophy.

- Teamwork is an integral part of the quality system. The importance of the teamwork concept was discussed through several studies in the literature such as Thiagarajan (1997) who stated that successful organisations are run by teams for solving problems, improving quality, and introducing new processes and products. Therefore, it was essential to find out "does the company make effective use of quality improvement teams?" The mean value was (2) which is within the range of agree response. As in table (6.7) there was a statistically significant difference among the "agree" responses to this statement. These results indicate that the client's construction company emphasise on effectively the use of the concept of team for running their activities, which in turn has a positive impact on the implementation of the TQM programme.

Conclusion

The questionnaires survey was designed to cover the main principles related to the people management concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.3). The overall mean average obtained for the people management statements is (2.05) and this average is located within the range corresponding to "agree". The obtained results established that most "people management" statements are well understood and that employees among client's construction company have a fairly good perception of the concept. This will lead to a positive impact on the adoption of the TQM philosophy. McCarthy (2005) in section 4.8.3, stated in some organisations in UK all employees participated in the development of the mission and values. Elsewhere, employees or groups of employees had the opportunity to comment on mission and values before they were finalised, while in other organisations, leaders developed the mission and values and communicated them to employees. Therefore, the results of the finding can categorise the client company in relation to organisations whose employees or groups of employees had the opportunity to comment on the mission and values before they were finalised.

6.3.4 Partnerships and Resources

The partnerships and resources statements are based on the main principles discussed in the literature review as in Section (4.8.4) and listed in table (6.8).

Table 6.8: Descriptive Statistics: The Partnerships and Resources Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi-Square (Obtained)	Chi-Square (Critical)
1	The resources are deployed in development the company activities.	2.3437	.93703	28.312**	13.28
2	Company management recognizes that the effective communication is the key towards creating a quality environment within the departments.	2.2812	1.14256	11.125**	13.28
3	Company uses an appropriate system for the managing the financial resources.	2.2500	1.13592	9.563**	13.28
4	Company resources are sufficient to implement Total Quality Management.	2.2188	.97499	19.250**	13.28
5	Company and its partners work together for the same goals.	2.1875	1.06066	14.250**	13.28

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the partnership and resources statements which are tabulated in table (6.8) indicated the following:

- The EFQM, as in Section (4.8.4), defined an excellent organisational plan and managed external partnerships, suppliers and internal resources such as buildings, equipment, technology and materials in order to support policy and strategy as well as the effective operation of processes. Therefore, it was essential to find out "do the resources deployed in the development of company activities?" The mean value was (2.3437) which is within the range of the agree response. As in table (6.8) there was

a statistically significant difference among the "agree" responses to this statement. These results show that client's construction company emphasis the importance of resources being deployed in the development of company activities, which in turn have a positive impact on the implementation of TQM philosophy.

- Communication is one of the important elements of a quality system. This issue was discussed in section (4.8.4) were Asher (1993) stated that the best organisations recognise that communication could become the difference between success and failure. Therefore, it was essential to find out: "does the company management recognize that effective communication is the key towards creating a quality environment within the departments?" As in table (6.8) there was no statistically significant difference among the responses to this statement. The results indicate that there is a convergence between the occurrences of responses from the employees in client's construction company regarding this statement.

- Financial resources are necessary for the success of any business. According to Oakland and Marosszeky (2006), investment is the key for the future development and growth of business. Therefore, it was essential to find out: "does the company use an appropriate system for managing its financial resources?" As in table (6.8) there was no statistically significant difference among the responses to this statement. These results indicate that there is a convergence between the occurrences of responses from employees in client's construction company regarding this statement.

- The resources come in many forms such as financial, information, material, and technology resources, as mentioned in Bell, McBride, and Wilson (2000). So, the availability of resources is essential to the success of adopting any kind of quality system. Therefore, the organisation must provide resources to support its operations, and to find out whether "company resources are sufficient to implement Total Quality Management". The mean value was (2.2188) which is within the range of the agree response. As in table (6.8) there was a statistically significant difference among "agree" responses to the statement that "company resources are sufficient to implement Total Quality Management". These results show that there is emphasis

on resources is available to support the implementation of TQM philosophy in client's construction company.

- In construction projects, most of the activities are outsourced. That means that subcontractors have enormous clout in guiding the main contractors' projects towards success or failure, so companies and their partners ought to share their goals. Therefore, it was essential to find out whether "the company and its partners are work together for the same goals". The mean value was (2.1875) which is within the range of the agree response. As in table (6.8) there was a statistically significant difference among the "agree" responses to this statement. These results indicate that client's construction company emphasis that they are working together with their partners for the same goal, which in turn has a positive impact on the implementation of the TQM programme.

Conclusion

The questionnaires survey was designed to cover the main principles related to the partnerships and resources concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.4). The overall mean average obtained for the partnership and resources statements is (2.256) and this average is located within the range corresponding to "agree". The obtained results indicated that most "partnerships and resources" statements are being implemented. Therefore, it may conclude that the perception of partnerships and resources in client's construction company in Qatar is sufficient to implement TQM programme. The results of the finding emphasise what was found in the literature section (4.8.4) such as Oakland and Marosszeky (2006), namely, investment is the key for the future development and growth of any business. The employees of the client construction company emphasise that the company management recognizes effective communication as the key towards creating a quality environment within the departments. This is supported in several studies regarding the importance of communication in the implementation of TQM philosophy such as (Kanji and Asher, 1993 in Thiagarajan and Zairi, 1997) who also agreed that the best organisations always recognise that communication could make the difference between success and failure.

6.3.5 Process

The process statements are based on the main principles discussed in the literature review as in section (4.8.5) and listed in table (6.9).

Table (6.9): Descriptive Statistics: The Process Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi Square	Chi-Square Critical
1	Company focusing on the processes more than end results	2.3437	1.06587	12.375**	13.28
2	Company processes are systematically managed and improved regularly.	2.2812	1.05446	17.375**	13.28
3	Company processes designed and developed based on customer needs and expectations.	2.1563	1.24717	11.250*	11.34
4	Company encourages the innovation and creativity in process performance improvement.	2.0625	1.01401	18.938**	13.28
5	Company process performance measured, and customer feedback considered.	2.0000	1.04727	17.688**	13.28

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the processes statements which are tabulated in table (6.9) indicated the following:

- According to Lee and Dale (1998) as in section (4.8.2), stated that the principles of policy deployment can be summarised as focus on processes, not results, and all members of the organisation are responsible for the process leading to the results. Moreover, leading construction companies like (ABB) focused on the processes such as their project called “Simplified process” in (1998), with the aim to achieve better performances and to develop an organisational asset coherent with quality and competitiveness objectives. Therefore, it was essential to ensure that the whether the

"company focusing on the processes more than end results" As in table (6.9) there was no statistically significant difference among the responses to the statement. These results show that there is a convergence between the occurrences of responses from employees in client's construction company regarding this statement.

- The EFQM, (1999) as in section (4.8.5), one of the sub-criteria for the processes elements is how processes are systematically designed and managed. Also, Dale (1996), in section (4.8.5) stated if an improvement process is to progress in a continuous and incremental manner it is necessary to evaluate it at regular intervals in order to identify the next steps. Therefore, it was important to find out does the "Company processes are systematically managed and improved regularly". The mean value was (2.2812) which is within the range of agree response. As in table (6.9) there was statistically significant difference among the responses to the "agree" response to this statement. These results indicate that client's construction companies emphasise the importance of continuous improvement of the company processes and it is envisaged that in turn it will have a positive impact on the implementation of the TQM philosophy.

- According to Castilla and Ruiz (2008) study as in section (4.8.5), the processes must be focussed on the satisfaction of internal and external customer needs and expectations. As in table (6.9) it was important to ensure that whether the "company processes designed and developed based on customer needs and expectations". Therefore, there was no statistically significant difference among the responses to this statement. These results indicate that there is convergence between the occurrences of the responses from the employees in client's construction company.

- According to Oakland (2006) as in section (4.8.5), considered the using of the innovation and creativity to improve processes as a process management best practice companies. Therefore, it was essential to find out whether the "company encourages the innovation and creativity in process performance improvement". The mean value was (2.0625) which is within the range of agree response. As in table (6.9) there was a statistically significant difference among the responses to the "agree" response for this statement. These results show that client's construction

company in Qatar emphasis the importance of innovation and creativity in the process performance improvement, which in turn has a positive impact on the implementation of the TQM philosophy.

- Focusing in controlling and measuring the process performance was one of the important stages in the era of development of TQM, Garvin study (1988), as in section (2.5.1). Therefore, it was essential to find out; "whether the company process performance measured, and customer feedback considered"? The mean value was (2) which is within the range of agree response. As in table (6.9) there was statistically significant difference among the responses to the "agree" response for the statement. The results indicate that client's construction company put significant emphasis on the measurement and the customer feedback is considered as an integral part of the quality systems, which in turn has a positive impact on the implementation of the TQM philosophy.

Conclusion

The questionnaires survey was designed to cover the main principles related to the processes concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.5). The overall mean average obtained for the processes statements is (2.1687) and this average is located within the range corresponding to "agree". The obtained results established that most of "processes" statements are well understood from the construction companies' standpoint in Qatar. The obtained results agreed with Zairi (2006) as reported in section (4.8.5), that the success of the quality improvement process depends on effective and systematic implementation. Therefore, it may be concluded that the client's construction company in Qatar have some awareness of the importance of the processes, which in turn has an impact on the adoption of TQM philosophy.

6.3.6 Customer Results

The customer results statements are based on the main principles discussed in the literature review as in section (4.8.6) and listed in table (6.10).

Table 6.10: Descriptive Statistics: The Customer Results Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi Square (Obtained)	Chi Square (Critical)
1	The customer service in the company is effective	3.9688	.73985	19.250*	11.34
2	Company provides shareholders with truthful information in full transparency	2.2813	1.05446	17.375**	13.28
3	Customer perceptions in our company measured by customer surveys, focus groups, compliments and complaints	2.2188	.97499	5.250*	11.34
4	Company adopted internal performance indicators to monitor, predict and improve customer perception.	2.0938	.96250	5.750*	11.34
5	The most important strategy in our company is to achieve customer satisfaction	2.0937	1.20106	16.438**	13.28

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaires results for the processes statements which are tabulated in table (6.10) indicated the following:

- The effectiveness of customer service in any organisation is essential to providing the services that meet customers' needs. According to Gilbert and Veloutsou study (2006), as discussed in section (4.8.6), industries such as fast food restaurants were rated with a lower service satisfaction rate than other industries. Therefore, it was essential to find out whether "customer service in the company is effective". The mean value was (3.9688) which is within the range of the disagree response. As in table (6.10) there was a statistically significant difference among the "disagree" responses to the statement that "customer service in the company is effective". The results show that the employees in client's construction company in Qatar disagree on this statement, and emphasis that customer service in construction companies in Qatar is ineffective, which in turn has a negative impact on the implementation of the TQM philosophy.

- According to the EFQM model, as in section (4.8.6), fluent communication with shareholders using transparent and truthful information is one aspect of customer satisfaction. Therefore, it was essential to find out: "does the company provide shareholders with truthful information in full transparency?" The mean value was (2.2813) which is within the range of the agree response. As in table (6.10) there was a statistically significant difference among the "agree" responses to this statement. These results indicate that the client's construction company emphasis transparent communication with shareholders, which in turn has a positive impact on the implementation of the TQM philosophy.

- The EFQM (2006), as in section (4.8.6), shows customers' perception of the organisation through customer surveys, focus groups, compliments, and external resources rating. Therefore, it was essential to find out whether "customer perceptions in the company are measured by customer surveys, focus groups, compliments and complaints". As in table (6.10) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company in Qatar regarding this statement.

- According to the EFQM (1999) in section (4.8.6), the performance indicators are one of the sub-criteria for customer results concerning the end user of the company. Therefore, it was important to find out whether "the company adopted internal performance indicators to monitor, predict, and improve customer perception". As in table (6.10) there was no statistically significant difference among the responses to the statement that "the company adopted internal performance indicators to monitor, predict, and improve customer perception". The results show that there is convergence between the occurrences of responses from employees of client's construction companies regarding this statement.

- According to King, Chang and Ton Su (2003), as discussed in section (4.8.6), customer satisfaction should play a central role in the company's TQM. It should also be one of the most important strategies and issues for the corporation in the future. Therefore, it was essential to find out: "is the most important strategy in the company the achievement of customer satisfaction?" The mean value was (2.0937) which is within the range of the agree response. As in table (6.10) there was a statistically significant difference among the "agree" responses to this statement. The results indicate that the client's construction company emphasis the importance of customers' satisfaction which is considered part of their strategies, which in turn has a positive impact on the implementation of the TQM philosophy.

Conclusion

The questionnaires survey was designed to cover the main principles related to the customer results concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.6). The overall mean average obtained for the customer results statements is (2.531) and this average is located within the range corresponding to "agree". The obtained results established that client's construction company in Qatar agree and have a perception similar to the most of the customer satisfaction statements. The exception is in the statement "the customer service in the company is effective". Therefore, it may be concluded that the increasing awareness is important to customer service in the company and is essential to the successful implementation of the TQM philosophy. The results

obtained are supported several studies in the literature (section 4.8.6) such as Claes Fornell et al. (1996), who emphasise the importance of adopting such an index to analyse the customer satisfaction level. Likewise, the client construction company also adopted an internal performance indicator to monitor, predict, and improve customer perception.

6.3.7 People Results

The people results statements are based on the main principles discussed in the literature review as in section (4.8.7) and listed in table (6.11).

Table 6.11: Descriptive Statistics: The People Results Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi-Square (Obtained)	Chi-Square (Critical)
1	Employees in our company are satisfy regards to the salary and wages	2.4063	1.38795	10.188**	13.28
2	Employees perceptions in our company measured by customer surveys, focus groups, compliments and complaints	2.3750	1.09985	1.750*	11.34
3	Our company motivates the employees by provides learning opportunities for all.	2.2813	1.27594	9.563**	13.28
4	Our company motivates the employees by provides training for all.	2.2812	1.11397	15.188**	13.28
5	Employees in our company are satisfy regards to the health and safety	2.2187	1.21109	10.188**	13.28

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the people results statements which are tabulated in table (6.11) indicated the following:

- Salary and wages were among the aspects related to the people results discussed in section (4.8.7). Therefore, it was essential to find out whether "Employees in the company are satisfied regarding their salary and wages" As in table (6.11) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- The EFQM (2006), as in section (4.8.7), shows people's perception of how the organisation is managing its network of external resources (obtained, for example, from surveys, focus groups, interviews, structured appraisals). Therefore, it was essential to find out whether "employees' perceptions of the company are measured by customer surveys, focus groups, interviews, structured appraisals" As in table (6.11) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- Learning opportunity is one important aspect related to the people results discussed in section (4.8.7). Therefore, it was essential to find out: "does the company motivate its employees by providing learning opportunities for all?" As in table (6.11) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of the responses from employees of client's construction company regarding this statement.

- In the section (7.3), training is considered one important requirement for the implementation of TQM; moreover training is an aspect that is related to the people results in section (4.8.7). Therefore, it was essential to find out: "does the company motivate its employees by providing training for all?" The mean value was (2.2812) which is within the range of the agree response. As in table (6.11) there was a statistically significant difference among the "agree" responses to this statement. These results indicate that client's construction company understood and emphasised the importance of training in the improvement of their employee's

performance. Therefore, they motivate the employees by providing training for them, which in turn has a positive impact on the implementation of the TQM philosophy.

- Health and safety are among the aspects related to the people results discussed in section (4.8.7). Therefore, it was essential to find out whether "Employees in the company are satisfying regards to the health and safety". As in table (6.11) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

Conclusion

The questionnaires survey was designed to cover the main principles related to the people results. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.6). The overall mean average obtained for the people results statements is (2.3125) and this average is located within the range corresponding to "agree". The obtained results revealed that, employees of client's construction company are agreed with the perception of the people satisfaction statements. Therefore, it may be concluded that construction companies in Qatar do realize the importance of employee-satisfaction, which in turn has a positive impact on the TQM implementation. The results obtained emphasise that the client construction company ought to motivate its employees by providing training, learning, and more overall satisfaction regarding their health and safety. These findings are considered to be the main aspects of people results discussed by Juan and Oscar (2008) in section 4.8.7.

6.3.8 Society Results

The society results statements are based on the main principles discussed in the literature review as in Section (4.8.8) and listed in Table (6.12).

Table 6.12: Descriptive statistics: The Society Results Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi- Square (Obtained)	Chi- Square (Critical)
1	Our company actively participate in social activities	2.5313	.91526	6.250*	11.34
2	Company's evaluations of quality results are spreading to the society	2.3750	1.12880	11.750**	13.28
3	Our company involvement in training and education of community members	2.3125	.96512	8.250*	11.34
4	Our company seeks to build a good relation with quality institutions	2.1563	1.11034	11.750**	13.28
5	The society who decide the continuity of our company in business	2.0937	.99545	4.750*	11.34

* Based on the statistical significance is (0.01) and the degree of freedom is (3).
** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the impact on society statements which are tabulated in table (6.12) indicated the following:

- Corporate social responsibility is an active participation in the organisation's social activities, as discussed in section (4.8.8) in the study of Castilla and Ruiz (2006). Therefore, it was essential to find out: "does the company actively participate in social activities?" As in table (6.12) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company in Qatar regarding this statement.

- According to Castilla and Ruiz (2006), corporate social responsibility is through spreading the results of an organisation's evaluations in several areas such as environment, ethics, risk at work and quality, as discussed in section (4.8.8). Therefore, it was essential to find out: "is the company's evaluation of quality results spreading to society?" As in table (6.12) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- The importance of education and training was discussed in several elements of the EFQM model as an integral part of the quality system development. According to Castilla and Ruiz (2006), as discussed in section (4.8.8), the society results emphasise that the organisation should involve itself with community via education and training of community members. Therefore, it was essential to find out: "is the company involved in training and education of community members?" As in table (6.12) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- According to Castilla and Ruiz (2006), as discussed in section (4.8.8), corporate social responsibility via social involvement by the organisation and corporate reputation is a criterion directly related to quality institutions. Therefore, it was essential to find out: "does the company seek to build a good relation with quality institutions?" As in table (6.12) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- According to Nikos and Margot (2004), who showed the impact of society on the business as in section (4.8.8), in the modern business world, maximum profits are not enough to guarantee survival and stay in business. It also needs to earn and retain the consent of society at large. Therefore, it was essential to find out whether

"it is society who decides the continuity of a company in business". As in table (6.12) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

Conclusion:

The questionnaires survey was designed to cover the main principles related to the society results. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.8). The overall mean average obtained for the impact on society statements is (2.293) and this average is located within the range corresponding to "agree". Therefore, it may be concluded that the employees of client's construction company in Qatar do agree with most of the statements related to the impact on society. The results obtained indicated that the client construction company plays a significant role in the community and actively participates in their social activities. This finding was emphasised by Avlonas, Margaria and Vanzon (2004) in section 4.8.8 who stated that in the modern world, organisations of every size and in every market have to earn and retain the consent of society at large to stay in business.

6.3.9 Key Performance Results

The key performance results statements are based on the main principles discussed in the literature review as in section (4.8.9) and listed in table (6.13).

Table 6.13: Descriptive statistics: The Key Performance Results Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi Square (Obtained)	Chi-Square (Critical)
1	The main goal of the measurement in our company is to ensure that the customer requirements have been met.	2.2812	1.27594	3.750*	11.34
2	Knowledge management is the main component in the company (KPRs)	2.2500	1.07763	20.812**	13.28
3	(KPRs) in our company cover the financial and non-financial results.	2.1875	1.02980	18.625**	13.28
4	Company trend is to review and improve the key results regally.	2.1250	.94186	12.000*	11.34
5	Proper system exists to measuring key performance results (KPRs)	1.8437	1.11034	25.812**	13.28

* Based on the statistical significance is (0.01) and the degree of freedom is (3).

** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the key performance results statements which are tabulated in table (6.13) indicated the following:

- The performance measurement is an integral part of the TQM framework according to Rodney and Bannister (2001) as discussed in section (4.9.8). Oakland (2006) stated that ensuring that customers' requirements have been met is the one reason for performance measurement. Therefore, it was essential to find out whether "the main goal of the measurement in the company is to ensure that customer requirements have been met". As in table (6.13) there was no statistically significant

difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- Knowledge management is one aspect discussed in the key performance results element of the EFQM model. Castilla and Ruiz (2006), as in section (4.8.9), stated that the benefits of knowledge management should be demonstrated in the key performance indicators of the organisation. Therefore, it was essential to find out: "is knowledge management the main component in the company (KPRs)?" The mean value was (2.25) which is within the range of the agree response. As in table (6.13) there was a statistically significant difference among the "agree" responses to this statement. The results indicate that client's construction company emphasise importance of knowledge management and considered this as the main component in the company (Key Performance Results), which in turn has a positive impact on the implementation of the TQM philosophy.

- The EFQM model (1999) shows the importance of key performance results. Therefore, it carries the highest weighting of the results criteria (15 percent), and covers both financial and non-financial results. Therefore, it was essential to find out whether "key performance results in the company cover both financial and non-financial results". The mean value was (2.1875) which is within the range of agree response. Therefore, there was a statistically significant difference among the "agree" responses to this statement. These results indicate that client's construction company emphasise that key performance results (KPRs) do cover the financial and non-financial results, which in turn has a positive impact on implementation of the TQM programme.

- According to Mann, Adebanjo and Kehoe (1999), who listed some examples of best practice in business results such as financial targets, these are typically set on an annual basis with a trend to improve over a number of years, as in section (4.8.9). Therefore, it was essential to find out whether "the company trend is to review and improve the key results regally". The mean value was (2.125) which is within the range of the agree response. As in table (6.13) there was a statistically significant difference among the "agree" responses to this statement. These results emphasis on

trend in client's construction company in Qatar is to review and improve the key results regally, which in turn has a positive impact on the implementation of the TQM philosophy.

- According to McAdam and Bannister (2001), the characteristic effective performance measurement system including measurements should reflect progress visibility and problem elimination as discussed in section (4.8.9). Therefore, it was essential to find out whether "a proper system exists for measuring key performance results (KPRs)". The mean value was (1.8437) which is within the range of strongly agree responses. As in table (6.13) there was a statistically significant difference among the "strongly agree" responses to this statement. These results indicate that employees of client's construction company in Qatar trusted the existing system and considered it as an adequate system that might be used to measure key performance results, which in turn has a positive impact on the implementation of the TQM philosophy.

Conclusion

The questionnaires survey was designed to cover the main principles related to the business results concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.9). The overall mean average obtained for the business results statements is (2.137) and this average is located within the range corresponding to "agree". The obtained results established that the "business results" statements are well understood by most of the employees of client's construction company in Qatar. Therefore, it may be concluded that the client's construction company in Qatar have an adequate view of the business results concept, which in turn has a positive impact on the adoption of the TQM philosophy. The results obtained are in line with McAdam and Bannister (2001) in section 4.8.9. They discuss the need for performance measurement within TQM frameworks. Furthermore, they argued that the measures must include hard and soft measures.

6.3.10 Continuous Improvement Results

The continuous improvement results statements are based on the main principles discussed in the literature review as in section (4.9.1) and listed in table (6.14).

Table 6.14: Descriptive Statistics: The Continuous Improvement Results Statements Descending Listed according to Means

S	Statements	Mean	Standard deviation	Chi-Square Obtained	Chi-Square Critical
1	Management spends a lot of time to improve the company processes	2.5938	1.10306	19.875**	13.28
2	All Employees are trained to implement the continuous improvement philosophy in their daily activity.	2.5000	1.13592	9.250**	13.28
3	Tools and techniques is the mean for company to adopt continuous improvement philosophy.	2.5000	1.13592	14.563**	13.28
4	Our company depends on assessment and feedback to enhance the continuous improvement	2.4063	1.07341	2.750*	11.34
5	Employees are believed on that the continuous improvement is a mean to gain a competitive advantage	2.3437	1.28539	7.688**	13.28

* Based on the statistical significance is (0.01) and the degree of freedom is (3).
** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the Continuous improvement statements which are tabulated in table (6.14) indicated the following:

- The lack of commitment in the organisation is considered key barriers towards continuous improvement and everyone is responsible for improvement as emerged from the interview in section (5.4.10). The commitment of the top management is

vital to any quality system according to Cecilia (2005). Therefore, it was essential to find out whether the "the management spends sufficient time to improve the company processes". The mean value was (2.5938) which is within the range of the agree response. As in table (6.14) there was a statistically significant difference among the "agree" responses to this statement. These results indicate that managers of client's construction company are keen to improve company processes and put significant emphasis on such processes, which in turn has a positive impact on the implementation of the TQM philosophy.

- The interview established that the lack of attention to employees' training in order to improve quality implementation in their activities is one of several barriers to continuous improvement. Moreover, Oakland (2006) as discussed in section (4.9.1), pointed out that managers must show they are serious by establishing a systematic approach and providing the training and implementation the support required. Therefore, it was essential to find out whether "employees are trained to implement the continuous improvement philosophy in their daily activity". As in table (6.14) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- Continuous improvement is basic to a management philosophy and it is an integral part of the total quality management. The TQM tools and techniques are considered as the means for managers to continually improve their processes and activities. Therefore, it was essential to find out: "are the tools and techniques the means for the company to adopt a continuous improvement philosophy?" The mean value was (2.50) which is within the range of agree response. As in table (6.14) there was a statistically significant difference among the "agree" response to this statement. These results show that client's construction company emphasis on the importance of the tools and techniques in the adoption of the continuous improvement philosophy, which in turn has a positive impact on the implementation of the TQM programme.

- Total quality management philosophy concerns the effort to achieve the maximum level of control and reach into the heart of employees by self-assessment rather than someone else assessing them. According to Frances, Boer, and Gersten (2003), they argued that self-assessment can be used to identify and address barriers to continuous improvement implementation in order to "jump start" CI. Therefore, it was essential to find out: "does the company depend on assessment and feedback to enhance its continuous improvement?" As in table (6.14) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- Some researchers such as Frances, Boer and Gersten (2003) argued that the successful implementation of kaizen in Japan has led to the expectation that continuous improvement (CI) might offer companies a means to gain and maintain a competitive advantage in the turbulent 1980s and 1990s. Therefore, it was essential to find out whether "the employees believed that continuous improvement is a means towards gaining a competitive advantage". As in table (6.14) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

Conclusion

The questionnaires survey was designed to cover the main principles related to the continuous improvement concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.10). The overall mean average obtained for the business results statements is (2.468) and this average is located within the range corresponding to "agree". The obtained results established that most of "continuous improvement" statements relating to client's construction company are well understood. Therefore, it may be concluded that the client's constructions company in Qatar share those continuous improvement statements, which in turn has a positive impact on the adoption of TQM philosophy. The findings emphases Marin-Garcia, del Val, and Bonavia, (2008) in section 4.8.10 as they points out

that, many authors have considered continuous improvement as one of the basic tools for implanting systems of production based on total quality management.

6.3.11 Culture Results

The Culture results statements are based on the main principles discussed in the literature review as in section (4.9.2) and listed in table (6.15).

Table 6.15: Descriptive statistics: The Culture Results Statements Descending Listed According to Means

S	Statements	Mean	Standard deviation	Chi- Square Obtained	Chi-Square Critical
1	Mix company culture is an advantage to adopt TQM	2.5938	.97912	3.750*	11.34
2	Qatari traditions and culture contribute to change resistance	2.3437	1.09572	13.312**	13.28
3	Current company culture become as a barrier towards diffusion globally.	2.3125	.89578	11.250*	11.34
4	Existing company culture is the barrier to implement TQM philosophy.	2.2813	.85135	31.437**	13.28
5	The culture of company are formed from employments behaviour	2.1875	.82060	10.500*	11.34

* Based on the statistical significance is (0.01) and the degree of freedom is (3).
** Base on the statistical significance is (0.01) and the degree of freedom is (4).

The questionnaire results for the Culture statements which are tabulated in table (6.15) indicated the following:

- The interview, as in section (5.4.8), shows that the mixed nationality of the workers has led to maintaining quality implementation in Qatar being more difficult than in other countries. Therefore, to examine the reality of the above statement, it was essential to find out: “is the mixed company culture an advantage for adopting TQM?” As in table (6.15) there was no statistically significant

difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from employees of client's construction company regarding this statement.

- The implementation of the TQM process is one of the most complex activities that a company can undertake, because it requires comprehensive changes to the organisation's activities including cultural changes for everybody. Moreover, culture change is one of the critical success factors in the implementation of TQM. The resistance to change might occurred when individuals or groups perceived that the change will be a threat to them. The level of change resistance is different from one country to another and even between companies within the same country, while the role of the managers is crucial for overcoming employees' resistance by involving themselves in the process. Therefore, it was essential to find out: "do the Qatari traditions and culture contribute to resistance to change?" The mean value was (2.343) which is within the range of agree response. As in table (6.15) there was a statistically significant difference among the "agree" responses to this statement. These results show that client's construction company emphasis on that considering the Qatari culture have an impact and thus contribute to minimise the change-resistance, which in turn has a positive impact on the implementation of the TQM philosophy.

- According to Michael Beer et al. (1985), as in section (4.9.2), one could expect that the national culture might provide a barrier to international diffusion. Therefore, it was essential to find out whether "the current company culture becomes a barrier towards diffusion globally" As in table (6.15) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses from the employees of client's construction company regarding this statement.

- Kano and Noriaki (1993) as in section (4.9.2), argued that culture is not a barrier to the implementation of TQM, and emphasised to the need to take cultural background into account when implementing TQM. Therefore, it was essential to find out whether "the existing company culture is a barrier to implementing the

TQM philosophy". As in table (6.15) there was statistically significant difference among the responses to this statement. The results show that client construction company emphasis on that the existing company culture is a barriers to implementing the TQM philosophy.

- The culture of the organisation refers to the cumulative of employees' behaviours. Many definitions for the concept of culture were discussed in the literature as in section (4.9.2). For Assael (1987), culture is "the norms, beliefs and lead to common patterns of behaviour". Oakland and Marosszeky (2006), as in section (4.9.2), also stated that the culture within an organisation is formed by some components such as behaviours based on people's interactions. Therefore, it was essential to find out: "is the culture of a company formed by the employees' behaviour?" As in table (6.15) there was no statistically significant difference among the responses to this statement. The results show that there is convergence between the occurrences of responses the employees of client's construction company regarding this statement.

Conclusion

The questionnaires survey was designed to cover the main principles related to the cultures concept. The questions were asked in the form of questionnaires statements, and the results obtained in this study are discussed in detail in section (6.3.11). The overall mean average for the cultures statements is (2.343) and this average is located within the range corresponding to "agree". The obtained results established that most of "cultures" statements are well understood in Construction Company in Qatar. Therefore, it may be concluded that the client's construction company in Qatar are in agreement as far as the culture statements are concerned, which in turn has a positive impact on the adoption of TQM philosophy.

6.4 How Effective are TQM Principles when Implemented Among Construction Companies in Qatar?

The quality gurus, such as Zairi (1999), mentioned that one of the best methods to assess the effectiveness of policy and strategy is to use criteria of excellence from prestigious quality models such as the Malcolm Baldrige National Quality Award (MBNQA) and of the European Quality Award (EQA). Aiming to determine the effectiveness of TQM elements in construction companies in Qatar, elements from the European Foundation Quality Management model (EFQM) were used as a data collection framework for the questionnaires. The questionnaire variable used for this study is presented in section (4.8) and results are analysed in section (6.3). By discussing and analysing the results of the previous sections, the researcher listed the finding as follows:

1. There is a lack of understanding regarding the main purposes of the TQM, while the TQM concept is confused with other quality concepts such as ISO.
2. Clients' company implemented their quality system as a bottom to top, rather than top to bottom.
3. The customer service among construction companies in Qatar is ineffective.
4. Changing an organisation's culture in relation to construction companies in Qatar is the most difficult step in the implementation of the TQM philosophy.
5. Training in which the employees of construction companies in Qatar participate is scarce.
6. The main issues concerning client's construction company in Qatar are the cost, quality of the work, workers, and the frequent delay in the completion of projects.
7. Language is the main obstacle for improving the communication among employees of construction companies.
8. The lack of top management commitment among construction companies in Qatar is considered a barrier against continuous improvement.

9. The level of employees' perception of TQM principles is descending according to the average mean as follows:

- Customer satisfaction
- Continuous improvement
- Culture
- People satisfaction
- Impact on society
- Partnership and resources
- Processes
- Business results
- Policy and strategy
- People Management
- Leadership

6.5 Summary

This chapter has presented the results of the questionnaire, which was conducted in the course of this study. The quantitative results illustrate the situation of construction companies in Qatar and identify the concept and principles of the total quality management (TQM) from different angels. Table (6.16) summarised the main theme extracted from the quantitative results while the detailed recommendations are outlined in chapter 8.

Table (6.16): Summary of the Main Themes Extracted from the Quantitative Results

S	Main Theme	Description
1	Recruitment	Qatar's construction companies depend for the most part on people with little experience and recently graduated employees.
2	Training	The majority of employees in Qatar's construction companies lack adequate training which points to the need for more participation in training sessions.
3	Leadership commitment	Employee-empowerment, subordinates sharing in decision-making, and an effective process management system, are the main evidence of leadership commitment.
4	Policy & strategy	Resources never form an obstacle for implementing company policy and strategy. Moreover, the total quality concept is embraced in their strategy.
5	People management	The concept of team is effectively used for running organisation activities; also the rewards system is well implemented.
6	Partnership and Resources	The importance of resources being deployed in the development of company activities. The client company and its partners work together for the same goals.
7	Process	The client company processes are continually improved. Also, emphasis on the importance of innovation and creativity in the process performance improvement, as well as on measurement and customer feedback, are considered to be an integral part of the quality systems.
8	Customer	The customer service in Qatar's client construction company is

	Results	ineffective. Nevertheless, there is a transparent communication between the client company and the shareholders.
9	People Results	The client construction company understood and emphasised the importance of training for the improvement of their employees' performance. Therefore, they motivate employees by providing training for them, but the number of training sessions needs to increase.
10	Key Performance Results (KPRs)	The client construction company emphasises the importance of knowledge management, and considered this as the main component in the company's (KPRs). The KPRs do cover both the financial and non-financial results. Moreover, employees in client construction company trusted the existing system and considered it as an adequate system that might be used to measure key performance results.
11	Continuous Improvement	Tools and techniques are important in the adoption of the continuous improvement philosophy.
12	Culture Results	Qatari traditions and culture have an impact and thus contribute to minimising the change-resistance.

The next chapter will present the proposed TQM framework to guide the construction companies in Qatar to implement the concept in more positive manner.

Chapter 7: The Proposed TQM Framework

7.1 Introduction:

In previous chapters, the researcher discussed the TQM philosophy vis-à-vis the construction industry as indicated in the previous studies. A number of previous studies relating to TQM and the construction industry focus on the adaptation of TQM philosophy to overcome certain obstacles. Resulted obtained from the surveys suggest that the TQM can be successfully implemented in construction industries. The results indicate that culture was the commonest form of obstacle, causing difficulties in the implementation of the TQM philosophy.

To understand the situation of the construction companies in Qatar, the in-depth interview was followed by questionnaires conducted with the people involved in the client construction companies. The results of both the interviews and questionnaires enabled the researcher to extract the necessary ingredients that are required to implement TQM among construction companies in Qatar. Moreover, the responses to the research questions led to the development of a model that is consistent with the construction companies in Qatar in light of the TQM concept. This model is a modification of the EFQM model, which is reformed to fit in with the culture and environment of construction companies in Qatar.

The obtained results and a proposed framework together with the procedural requirements that are essential for the implementation of the TQM concept are given in the sections below. Furthermore, future research that can be carried out is also described.

7.2 Research Main Findings

The results of the research are based on two variables, 1- the construction companies and 2- total quality management. It is envisaged that TQM can be successfully implemented in a client's construction company, as there are good interactions and similarities between construction companies' management structure and total quality management framework.

The following integral parts of the TQM are evaluated with the view of implementing these within a construction industry.

- Leadership
- Policy and strategy
- People Management
- Partnership and resources
- Processes
- People satisfaction
- Customer satisfaction
- Impact on society
- Business results
- Continuous improvement
- Culture
- The main requirement for the implementation TQM in construction companies are: leadership participation, flexibility of the culture, customers focus, training, performance measurement, teamwork, monitoring and continuous improvement.

- The main issues that concerns the client in this study are: low skills of the workers, quality, and delay in projects progress and the main challenges that are faced not only by the client, but the construction companies in Qatar are: varieties of cultures, communications barriers and commitment of top management.

- The operating organization structure is different from the one presented in company documentations. One of the findings from the data collected was that the actual organization structure in size of the company (the client) is different and much smaller than the one officially stated in the official documents. This finding is of utmost importance due to the fact that a certain size of organization structure is one of the requirements for ISO certification and this further highlights the shortcoming of

ISO certification which appears to be documentation driven rather than demonstrating the actual processes and procedures, which is the case for TQM. Therefore, it can be stated and claimed that it is a real and timely contribution that the element of ISO certification related to structure does not work in construction industry in Qatar. There are companies including the one under scrutiny that will find ways to go around the ISO protocol and secure certification by false and misleading information presented and documented to secure ISO certification.

- There is no awareness about TQM in construction industry in Qatar at all levels of the organization. The only people who have awareness and some knowledge about the concept of TQM are those who work in quality assurance, even though, they do not have any knowledge of the implementation of TQM and how it can be introduced in practice. On the other hand, the concept of quality is a well-understood terminology by the employees within the company. The staffs are well aware of the fact that quality is of utmost importance for the company's profile and annual profits.

- Training is an integral part of TQM program. The survey resulted in one of the critical findings about the amount of training that employees in construction companies received. The majority of employees in Qatar's construction companies lack adequate training, which points to the need for more participation in training sessions.

- National cultures and cultural differences (working ethics) between staff members also play a crucial role in the environment of organisations that successfully implement the TQM approach, as the culture is considered as one of the important factors for the strong foundation of the TQM framework; in addition, it is also regarded as one of the most critical success factors for TQM implementation in the construction industry. Cultural barriers do exist in the clients company, as variety of cultures do exist and very often become a barrier / obstacle in the implementation of TQM. But does not prevent the implementation of TQM.

- The way that the clients' company implemented their quality system is a bottom to top instead of a top to bottom system. As stated by Butler's in (2007), mentioned in section (4.8.1), that leadership should be top-down and emphasises charisma as means to win employees' admiration and increase satisfaction. This issue was discussed with

the development manager of the company and suggested that the reason for the lack of confidence in the leadership towards a quality system is a major barrier. Therefore, the quality program should be directed at all levels rather than waiting for it to succeed in one section and then implemented in the other department or sections. It is also significantly important that the leadership becomes more committed towards supporting the quality program and owns it rather that pass on to others to adhere to.

7.3 Quality Trends and Contribution to Knowledge

Results obtained in this study are tabulated in Table (2.1) Chapter 2, and the critical analysis of quality that could be developed in the future and consider as a contribution to the knowledge are described in Table (7.1).

Table 7.1: Changing View of Quality

Past	Present	Future
Quality is the responsibility of blue collar workers and direct labour employees working on the product	Quality is everyone's responsibility, including white- collar workers, the indirect labour force and the overhead staff	Quality is everyone's responsibility including the society
Quality defects should be hidden from the customers and management	Defects should be highlighted and brought to the surface for corrective action	Focus on the prevention control
Quality problem lead to blame, faulty justifications and excuses	Quality problems lead to cooperative solutions	Learning and training avoid Quality problems
Corrections- to quality problems should be accompanied with minimum documentation	Documentation is essential for "lessons learnt" so that mistakes are not repeated	Documentation coupled with training
Increased quality will increase project costs	Improved quality saves money and increases business	Improved quality will increase company values

Quality is internally focused	Quality is customer focused	Quality is everyone's focus
Quality will not occur without close supervision of people	People want to produce quality products	People supervised themselves
Quality occurs during project execution	Quality occurs at project initiation and must be planned for within the project	Reliability of products and services (warranty)

Modified by the Researcher, Modification upon: Kerzner, H, (2003)

The above Table (7.1) suggested the future view of the quality and the contributions to knowledge as follow:

1. One of the important theoretical findings and contribution of this research to knowledge in TQM, is to expansion of the notation of TQM as something restricted to the members of the company or customers only (internal and external) as traditionally viewed in TQM literature. This research extends this focus and introduces the level of society, since quality expectations are shaped by local culture and society. Therefore, TQM in its full understanding and application should include the societal level in order to understand the social environment in which it operates.

2. Following from that, it is recommended that certain developments receive more attention than the others in the construction industry in Qatar. For example, the focus on prevention of faults rather than repair doesn't exist in Qatar at the moment. Despite this being not an original contribution to knowledge, it is important to bring this aspect to the awareness in the context of Qatar.

3. With focus on prevention there is a need to automatically introduce focus on learning and training in order to achieve this prevention, whereas is in the past the focus was more on blame and shame rather than fact findings, it is recommended that the company management should puts more emphasis on training and resources that are available at all levels rather than finding faults in workers, who are not trained to a defined procedure. This raises the question of procedural issue, how these are defined and derived within the processes allowing effective implementation of a TQM framework.

4. Following from focusing on prevention and training, it is recommended that with regards to documentations surrounding quality solutions and quality problems focus should be on documentation coupled with the training, since only recording quality problems and simply documenting these is not enough to put a preventive action plan in place. Failure to implement the appropriate training leaves the company constantly working in corrective action mode rather than moving towards the preventive one which is dictated by TQM philosophy. Therefore, documentations should always be coupled with learning processes, allowing a learning process from the documentation and focusing on the identification of the root causes within the procedural aspects.

5. The discussion to the quality is to recognize the impact of high quality on the overall value of the company. In the past, the focus on quality was as something that increases costs. Currently, the discussion surrounding reduces cost in relation to quality. However, this research suggests the need to recognize the impact that good quality has on the overall value of the business, value in financial terms but also value in reputation. This focus on quality should become one of the values that lead our company parts of the organization culture rather than tools.

6. It is important to understand that TQM is a "totality" concept rather than implemented in individual sections/ departments. Therefore, it is important not only to understand TQM in that terns, but implement it fully and comprehensively in all section of the industry. This research revealed that in the past quality was seen responsibility of individual internally, then from that the discussion shifting it to the customers. Whereas, it is strongly recommended that focus should be on internal and external customers and take these key points of TQM as guiding points for the focus on quality on all aspect of the suggested framework.

7. Another interesting element discovered was that people supervise themselves. The huge number of workers in this construction company causes difficulties in how to supervise them. Therefore, achieving the level where employees supervise themselves leads to achieving the maximum quality possible in their work. It is viewed that in future the willingness of people to achieve quality as in (Colum 2) should be taken as

a steppingstone but in addition educating and training aspects must be implemented to achieve quality outputs.

8. Quality should extend to after completion phase. It is suggested TQM should include the time period after sale and after the products is delivered and used by the clients. Therefore, the focus should be on warranty maintenance, which is currently not present in TQM literature.

It is important both to understand and evaluate the future of quality in a construction industry in Qatar. The ever increasing competitions in the construction industry have resulted in the short development quality models. Nevertheless the purpose of these models should be to develop quality product and provide quality service. With intense competition in construction industry, where quality has been acknowledged as more and more revenue generating process, an organisation cannot afford to ignore it or launch its product or service into the market with errors. Customer is never interested in the complex development details of the management structure. What customer demands is quality. Quality is what customer needs. Even a little deviation from the customer demands can lead to the poor quality of design.

In the recent years, people have been working for writing mature and effective procedures for requirement gathering. The variation in the characteristics of the customer plays a vital role in requirement gathering. Past experiences have shown that requirement gathering is relatively simple where customer characteristics are similar. The diverse the customer characteristics are, the more difficult it will be to gather the requirements, which will ultimately affect the quality of the product or service and for this purpose well defined standard operating procedures are required.

In construction industry, projects are very often delayed and in case of time constrained projects and events with diverse customer character set, it is difficult to set the agreed customer requirements. In this case, a mechanism is required to minimize the gap between the customers and the development and most importantly project management team. This method is required to incorporate the voice of customer in the design right at the early stage of the project. To achieve this goal Quality Function Deployment can be

used for developing a design quality, aimed at satisfying the diverse customer requirements, translating the customer demands into design target and major quality assurance point to be used throughout the construction phase.

The goal of this particular aspect of this study has been to emphasis the importance of Quality Function Deployment for effective project and event management. The findings of this study also suggest that there is a need to propose a model that is designed for integration of QFD team within the development phase to bridge the gap between the customer and developers and the ensure right first time development of the finally constructed product.

7.4 Implementation TQM in Construction Companies in Qatar

The TQM in the construction industry could be described as the processes of comprehensively planning and organizing, for the purpose of developing and improving the administrative and technical performance of the top management and all employees in the organisation. This is realised through participation of the leadership, training and continuous improvement, to improve output effectively, saving time and effort while meeting the needs of both internal and external customers. In other words, all involved must function as an integrated system to achieve the desired goals with efficiency and high quality.

The main question that emerged in this part of the research is this: what is required to develop and implement a TQM philosophy in the construction industry? The EFQM model was used in the research as a data collection framework and a path for the company to be a TQM organisation. Based on research results and the main principles of the TQM philosophy were discussed in the literature, the researcher enable to achieve a proposed framework for the implementation of the TQM philosophy in the construction company, “the client”.

Identification and preparation is the first step towards the implementation of a TQM philosophy which begins by collecting information in the area that has an impact on the improvement of the performance of employees in Qatar’s construction companies. As mentioned earlier in Chapter 2, Section 2.13, a very small amount of work related to

TQM has been carried out to date in developing countries in general, and particularly in Qatar.

The top management give the instructions to the employees to cooperate with the TQM leader. The role of the TQM leader at the first stage is to introduce in brief the concept and principles of the TQM. This stage is significantly very important because the concept of TQM is almost unknown to the most of the employees and this particular avenue became apparent during the interviews process. Moreover, the TQM leader has to explain the company's intention to adopt the TQM philosophy to run the company activities.

The organisational structure of the client's construction company, as shown in Figure (5.1), includes a development department, managed by the development manager whose main responsibility is to act as a management representative to monitor and improve the overall company management system. The development department represents the link between the departments and most of the employees working in this department who are familiar with the importance of implementing the total quality management system in the company as revealed by the interviews, as in Section (5.3.9). Therefore, the implementation of the TQM philosophy in the company must start from the development department. The development manager (TQM leader) should provide training, seminars, workshops, and presentations to other departments on the importance of the implementation of the TQM philosophy in the company. Spreading the awareness of TQM is essential, especially in the earlier stages because every person in the company must learn the concept before it can be applied. They have to know what will happen next and to do this; they have to be a part of the TQM system.

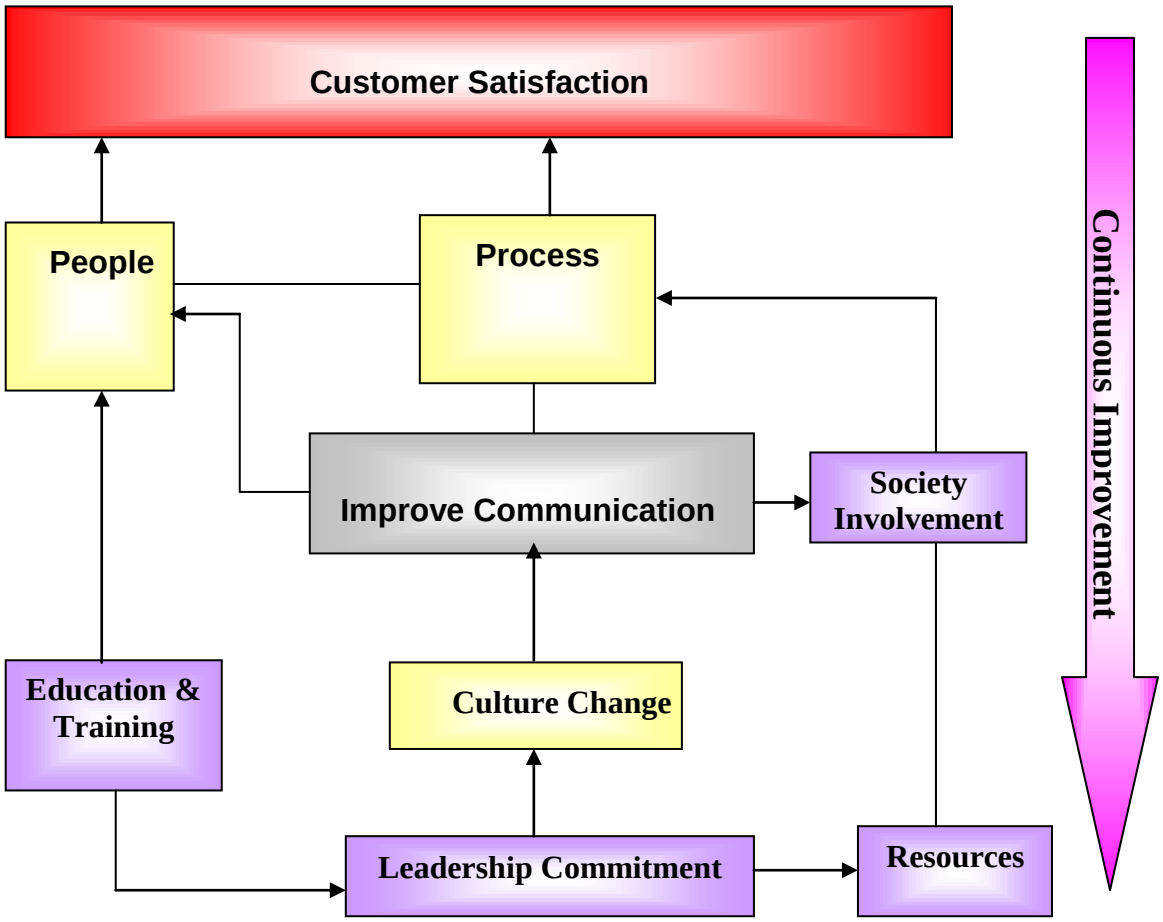


Figure (7.1): Proposed Framework

The proposed framework is based on ten criteria. Education and training are important element in the model which directed towards leadership and organisation people. Leadership is driven through entire organisation's strategy by spreading the awareness and changing the organisation culture to understanding TQM philosophy. The communication criteria go well beyond the organisational environment by including the society as an integrated part of the system, and besides these resources and processes are directed towards ultimate customer satisfaction. The customer feedback enables the drive towards continuous improvement, which is an integral and important element of TQM.

7.5 Critical Success Factors of the Framework

7.5.1 Leadership Commitment

Management understanding and commitment are essential in the implementation of the TQM philosophy. The role of leadership in the implementation of the TQM is very important as discussed in the literature review, see Section (4.8.1). The role of leadership is very clear for the Qatari construction companies. It will play a leading role in driving the TQM implementation towards a successful conclusion. The results of the interviews as in Section (5.3.4), and the results of the questionnaires as in Section (6.3.1), both indicated that the leadership of construction companies in Qatar perceived their role as part of the TQM philosophy. The mixed nationality of employees of construction companies in Qatar facilitated such a leadership role perhaps because the concept of leadership is also known and implemented in their countries of origin.

The leadership is the key issue of the model. Therefore, the interviews and questionnaires were focused on the top management levels that have the decision powers or at least the right for the suggestions for the development or implementing changes. In relation to TQM awareness within the organisation, the top management must be committed to giving support to TQM. The top management or leadership must be at the top of the quality hierarchy as presented in Figure (2.3). Although, the role of the leadership is clear for the employees of construction companies in Qatar, without active participation from the top management, the TQM effort will fail. So the top management must believe first that the TQM is the right course to follow. However, from the survey conducted it was established that there is a lack of commitment from the top management towards the implementation of the quality system since they concentrated more on fast track plans and profits. This issue is mainly due to a lack of involvement from the top management in the training sessions that are especially designed and focused on the quality implementation.

It became apparent during the interview process that most of the leadership in construction companies hold higher degrees and hail from different cultural and backgrounds. Therefore, background and culture have a positive impact in the level of understanding of the concept of leadership.

7.5.2 Education & Training

It was established from the interviews and the questionnaires that the training and communication are identified as problematic or an obstacle that the client company faces to implement TQM philosophy. Therefore, by involving the employees from all levels to the proper scheme for the training sessions and communication will be the path towards resolving the quality issues.

The advance education and suitable training of the leadership is the key issue for the implementation of the TQM philosophy. It will provide the managers with the skills that contribute to make them more conscious and serious in spreading the awareness as to the important of the TQM in the improvement of company processes. Moreover, training keeps mangers more knowledgeable about involving themselves in the search for a solution and removal of any barriers towards TQM implementation. The top management of construction companies represent the strongest node to the implementation of the TQM, and the emphasis is on the quality of their training which is essential for success. Therefore, such training should include quality tools and techniques, quality theories and the various aspects of implementation.

7.5.3 Culture Change

As previously described in Chapter 3, Section 3.5, the main problem of Qatari's construction companies in terms of immigration is the arrival of various Nationals bringing different cultures and working styles which are quite different from the Qatari culture and working ethics. These would accept changes if they feel that these changes will not affect their own culture and way of working. It was observed that Qatari culture might be one of the most important factors directing the way construction companies are managed. For that reason, the main aim of the proposed model for the implementation of TQM in Qatar is the merging of other working pathways into Qatari culture without any negative impact on the habits and traditions of Qatari culture.

The top management will expect some type of resistance against changes especially from lower managers, who are at times reluctant to adopt any new processes for development. Therefore, the role of the top management is to initiate and recommend changes in the

processes and systems through the dissemination of the relevant information that adhere to the principles of TQM within the construction company. This will encourage all employees to accept changes and development towards quality requirements through the support and conviction from the top management regarding the importance of the implementation of TQM in the company. The requirements for change need a lot of seminars and workshops involving employees from different management levels to clarify the benefits of TQM philosophy and its added value to the construction company.

7.5.4 Improve Communication

Communication is one of the important elements of a quality system. Moreover, the survey also indicated that the company management recognizes that effective communication is the key towards creating a quality environment within the entire company through implementation in every section and department at all levels.

7.5.5 Continuous Improvement

The construction companies either they are product based or service need to establish a feedback mechanism to help their internal as well as the external customers. The quality of service and product will certainly increase if the continuous improvement cycle is well embedded in TQM framework. The concept of continuous improvement basically distinguishes “TQM” philosophy from other quality philosophies. Therefore, by adopting the continuous improvement concept, the new initiative starting with new targets and taking the complete improvement process to everybody is indicating supplier and customer links in the quality chain. Obtaining information about progress and enhancing success.

It is important that the development department is closely liaising with the QA/QC section of the organization and shall be solely responsible for implementing all the process, procedures to ensure quality assurance and control is uniformly implemented throughout the organisation. The QA/QC section should always work in close collaboration with Project Management and Planning section and should be held responsible for the following:

1. Management Reporting
2. Risk Management
3. Issue Management
4. Change Management
5. Business Continuity Management
6. QA/QC on Asset Management
7. Document Control
8. Policies and Procedures
9. Key Performance Indicators
10. Training
11. Customer Satisfaction Surveys
12. QA/QC on Application Deployment
13. Design Walkthroughs
14. Order, Build Delivery Process

In the TQM framework, the head of QA/QC Section shall report directly to the Development Manager for all the quality related issues. The Development Manager highlights these issues to the company Director on weekly basis. The Director of Construction Company (The client) escalates these issues to the Senior Leadership Group on monthly basis.

The roles and responsibilities related to the quality procedures of the organisation and its structure should be available to every employee within the organisation.

- **Quality Processes and Procedures**

Management Reporting/ Risk/Action/Issue Management

Communication and data dissemination is an integral part of the TQM framework. The development manager as a head of QA/QC should produce the reports and disseminate new procedures for progress review in the management meeting to be held on weekly basis. The chairs the Progress Meeting and the action items, risks, issues etc. should be capture in the reporting pathway.

- **Order Build Delivery Process**

The head of QA/ QC shall ensure that the delivery and allocation process remains clear and understandable to the entire stakeholders. QA/QC section should define standard operating procedures that clearly states enter and exit criteria for the successful order build and completion process.

QA/QC section shall ensure that all the equipment is moved to the building site in a timely manner and during construction remains operational. Furthermore, QA/QC section shall also ensure that removal of the equipments and clearance of building material from the site takes place smoothly. The head of QA/QC shall communicate the progress to the project manager on weekly basis, who should keep the entire stakeholder informed during the construction process. If there are any delays or non-conformities are identified during the audit trail, these should be communicated and rectified according to the defined procedure.

Once communicated by the head of QA/QC, It is important that the organisation ensures that the clients receive high quality and consistent information not only relevant to the completion date but also keep them posted with the progress. If there are any delays in the project, that must also be communicated to the customer. Implementation of the changes to the process is the responsibility of QA/QC and it should be discussed with the top management at all stages of the project.

- **Change Management**

QA/QC section shall implement the change management process to ensure that any change(s) in the system/infrastructure/procedures are communicated to all the stakeholders. The change management process shall be placed to ensure that the entire change process go through a formal process of impact analysis and approval. It is proposed that the client builds in the following process for change management in the TQM framework. As is Figure (7.1).

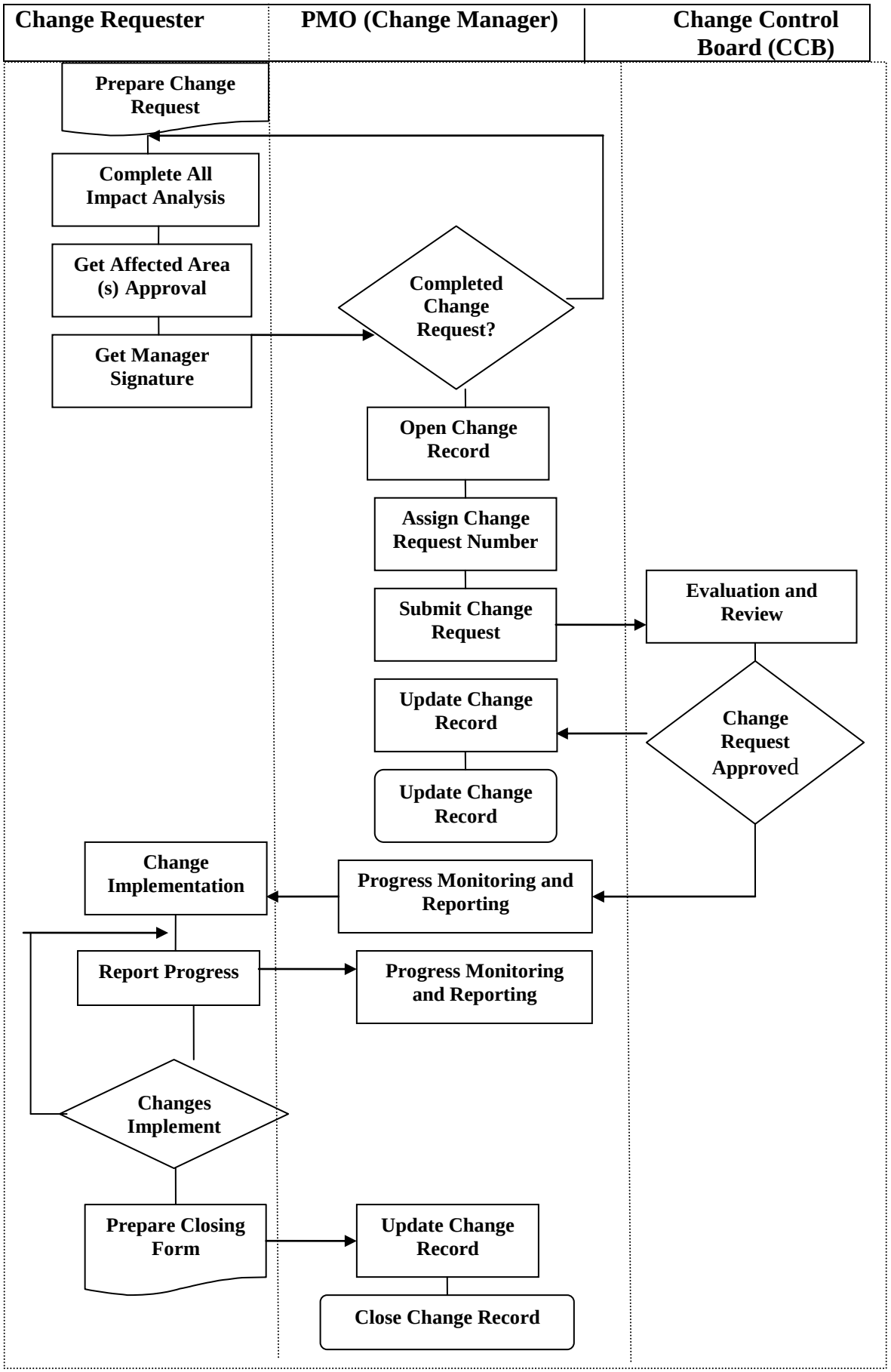


Figure (7.2): Change Management Process

For continuous improvement cycle to work effectively within the TQM framework, it is essential that change management is effective and documented record of both the suggested and implemented changes are timely communicated to all the stakeholders.

- **Business Continuity Management**

The success of the client (Construction Company) is highly dependant on well defined and measured deliverables. As it is highly dependant on technology, therefore there must be some kind of back up procedures and plans in place to ensure smooth running of every single project. Development department and QA/QC section should run different exercises and presentations before the new projects are initiated to ensure that detailed procedures and deliverables are communicated to the appropriate people, who are responsible for both the delivering and monitoring process. It may be appropriate for QA/QC section to conduct training workshops and communicate the requirements of the customer at each level. This will make the individuals (at all levels) to be aware of milestones and deliverables, allowing timely reporting of non-conformities whenever these arise. Hence, allowing the timely rectification of the processes within the procedures. Ultimately, an effective continuity management structure will help to meet the dead lines at all levels of the standard operating procedures resulting into timely delivery of the final constructed product to the customer. Customer should also be kept informed at all levels.

- **Document Control**

Development department and QA/QC section shall be made responsible for maintaining all the necessary documentation regarding all the procedures and processes. The document portal will be maintained where all the documentation will be available to all the stakeholders. The documents will be given unique document identification number to ensure consistency and accuracy. QA/QC shall conduct audit on the content of the portal and shall not be responsible for portal management. All the reports and management meeting minutes shall be maintained at the portal.

- **Policies and Procedures**

It shall be the responsibility of the Development department and QA/QC section ensuring that necessary business rules of the client are explained in terms of policies and procedures. QA shall make sure that these policies are communicated to all the stake holders. A list of all the policies should be available on the portal. The policies should be approved by the supervisors of the area(s) submitting it to the Policies Review Working Group and Senior Leadership Group. Building a well defined pathway in the TQM framework both for defining and implementing policies and procedures is an integral part of quality management structure. This allows taking everyone at all levels on board allowing the ownership of the TQM system. Once this is achieved, then the barriers of culture and ownership are eradicated straightaway.

- **Key Progress Indicators**

Progress shall be measured against agreed set of indicator and service level agreements with all the functional areas. A Key Progress indicator policy shall be put in place and communicated to all sections / departments of the organisation.

- **Training**

QA shall ensure that necessary documentation and user manuals for procedures and policies are widely available. Special training sessions shall be conducted for users for better understanding of the system and increased productivity.

- **Supplier Satisfaction Surveys**

QA shall make sure that the quality raw material is delivered by the supplier on demand in a timely manner. QA will conduct audits during the construction and development process, and also after the product/service has been provided and implemented. A log of these surveys shall be maintained which will help in grading the suppliers.

- **Design Walkthroughs**

There may be cases where the requirement are sometimes not clearly communicated to the supplier or the supplier has not taken the specifications on board, or some of the requirements are taken for granted as the organisation (client) don't explicitly specify these to the supplier. QA will make sure that the requirements of the project are clearly captured and understood initially by the design team. It can be ensured by conducting the "Design Walkthroughs" both with the project manager and the supplier. The walkthrough log shall be maintained and key findings shall be released officially to the design team and the top mismanagement of the organisation. The manager of the QC/QA shall chair the sessions of design walkthroughs.

- **Program Correspondence**

All communications including, memos, emails, faxes and letters are to be processed via the Project Management Office (PMO) so that a central record of correspondence can be kept. Reference numbers for such correspondence shall also be issued via the PMO.

- **Program Monthly Status Report**

A monthly status report shall be produced, reviewed and circulated as described in the organisational policy manual. This should be regularly audited by the development manager and QA/QC representatives.

- **Meetings and Minutes**

All formal meetings should be minuted. Where possible agendas should be agreed and published in advance.

- Agenda template
- Accomplishments by milestones for past period, Milestones missed Next period milestone review.
- Overall status

- Action item follow up
- Current issues (capture do not attempt to solve)
- Change requests (Capture, Review, Approve (pass to PMO), reject
- Potential risks
- Open discussion, Questions, Recap of meeting.

Where actions result from a meeting, they should be assigned to a person and an expected date agreed and documented. QA/QC shall chase the progress for the actions coming out of the management meeting. A separate report shall be presented to the senior management consisting of all the closed, pending or assigned actions items with current status of all the actions.

- **Management Reviews**

Management Reviews are those reviews that are used to monitor and control the progression of the project and operate at various levels. All these reviews shall be minuted and the minutes retained in the PMO. Quality issues shall always appear as an agenda item at any of the Management Reviews, as necessary.

The following sub-sections detail the types of management reviews to be held:

- **Checkpoint QA/QC Reviews**

QA/QC Checkpoint Reviews are to be performed by the PMO Quality Office as a senior management level shall check that the project is proceeding according to the plan, budget and meeting technical requirements. Client satisfaction is also assessed.

As the QA/QC Checkpoint Reviews are determined by their relationship to certain lifecycle activities, actual dates shall be tracked using the activity reports linked to deliverable and milestones. Where reviews from one Phase occur close to those of the other phases, then those reviews may be combined logistically (the checklists shall still be applied independently).

Dates shall be as scheduled and agreed with the PMO Quality Office.

- **Contract Approval and Review**

The following officers of the organisation shall have the responsibility to review and finalise the contract (and make any changes to the contract if deemed necessary):

The Director of the organisation	(to review all requirements including commercial)
The Project Manager	(to review technical requirements)
The Quality Section Head	(to review quality requirements)

Written (e-mail shall be made acceptable) approval of each of the above should be sought prior to signing the final copy of the contract with the customer.

- **Progress Reviews**

A Progress review shall be conducted at the completion of each phase (of the overall project) to ensure that the requirements, as defined in the contract, have been addressed. The review will determine the adequacy of the solution to date and that the processes are in place for the next phase. The Project Manager, Quality Manager and Supplier personnel will undertake the Progress Review. Further Progress Reviews shall be scheduled at the first review as deemed necessary.

To ensure that tight deadlines are met, it may be necessary to hold a Joint project review between the project manager and the suppliers on a weekly basis to review the weekly Progress Report and to discuss issues. This review shall be minuted; copies of the minutes are to be retained by the PMO. The Project Manager is responsible for progressing action items raised against his team.

- **Internal Project Review**

An internal Project review shall be held weekly to review progress and to discuss any issues. The Program Manager and all managers of the team attend this review. The review shall be minuted and actions assigned to attendees as necessary. Internal reviews at an individual team level shall be the responsibility of the various managers and are to be held at suitable intervals to control the work of their teams.

- **Post Project Review**

A post project review shall be conducted following completion of the project and handing over the building to the customer. The purpose of this will be to review the entire Project including all variations to scope and requirement, and how these impacted the overall progress, its cost and final acceptance by the customer.

- **Design and Document Reviews**

Design and document reviews shall be held in accordance with procedures defined in the policy manual of the organisation. All documents to be submitted to the customer (including detailed specifications) as deliverables should have been reviewed (and passed review) prior to formal delivery of the building (draft documents may of course be delivered for comment as long as they are identified as such). The PMO/QA/QC shall have the power to refuse the release of documents that have no evidence of review. This will ensure the quality and its function at all levels, ensuring the QA aspects for the customer. In addition, it will also ensure that QFD parameters are well deployed and exercised within the TQM framework.

Audits

- **Functional Audits**

A functional audit is a check that the functionality specified in the contract (and any approved changes prior to agreement) has been provided. It is at a very basic level and does not replace functional acceptance procedures. Functional audits shall be held during the acceptance stage to verify that all contracted functionality has been provided. Functional audits shall be conducted by the Quality Manager (or designate). Requirements include those defined for technical functionality and specification details.

- **Physical Audits**

A physical audit is a check that all items required for the building project have been physically delivered as per the contract (and any approved changes prior to start of the project on site).

Physical audits will be conducted during the construction process to ensure that all contracted items have been delivered. Physical audits shall be conducted by the Quality Manager (or designate). A physical audit shall be performed at a small number of sections and sub-sections randomly selected by the Quality Manager. This will further ensure that checks are in place during the progress of the project. It is envisaged that it will not only ensure quality but will improve productivity as well.

Compliance Audits

- **Scheduled Internal Audits**

These audits will focus on the level of compliance with documented plans and procedures. The Quality Manager shall conduct compliance audits. Internal audits shall cover all areas (including sub-contractors) in which work is being performed at the time of the audit.

Actual audit dates shall be established at least two weeks before the intended audit. There shall be three days scheduled for each audit being 0.5 days planning, 2 days auditing and 0.5 days reporting. As a general guidance, audit interviews should not exceed 2 hours for each person involved.

- **Unscheduled Internal Audits**

These audits may be called either by the Quality manager or the Project Manager to address any particular concern which they may have. They will probably concentrate on a specific area of the Project where the concern is perceived to be. The Quality Manager can also conduct these audits. A copy of all the processes and procedures shall be made available on the portal

7.6 Summary

This chapter discussed the interactions and similarities that existing between construction companies' management structure and TQM philosophy. Therefore, it is envisaged that TQM can be successfully implemented in construction companies in Qatar. The critical success factors such as Education & Training, leadership commitment, culture, communication, and continuous improvement are the foundations of TQM framework in construction companies in Qatar. The trend of quality began by changing view of quality to become broader and comprehensive as discussed in detail in section 7.3. The proposed framework for the implementation of TQM in construction companies in Qatar was discussed in Section 7.4.

Next chapter will deal with the recommendations and conclusions of the findings for future research in implementation of TQM philosophy in Qatar.

Chapter 8 Conclusions and Recommendations

8.1 Introduction

As described earlier, the main aim of this thesis was to develop a TQM framework that is applicable to the current situation of construction companies in the State of Qatar. This research has discussed and analysis the implementation of TQM within the Qatar construction companies. The thesis also identified a number of issues and employed a number of methods which ultimately led to the conclusions and recommendations presented in this chapter.

8.2 Conclusions

The research is made to delve in the issues regarding Quality Management and to analyze ways to effectively control technology processes within the suggested TQM framework for the client.

The ever increasing competitions in the field of product and services have resulted in the development of frameworks. Nevertheless, the purpose of these frameworks or in other terms life cycle models should be to develop quality product. With intense competition and quality being at the forefront of the products and service, more and more revenue generating processes (or profitability elements) are being linked to an organised structure that an organisation cannot afford to ignore to keep a leading position in the market. Customer is never interested in the complex development details of quality. What customer demands is quality product and service as an enuser. Quality is what customer needs. Even a little deviation from the customer demands can lead to the poor quality of design.

In the recent years, people have been working for writing mature and effective procedures for requirement gathering. The variation in the characteristics of the customer plays a vital role in requirement gathering. Experiences have shown that requirement gathering is relatively simple where customer characteristics are similar. The diverse the customer characteristics are, the more difficult it will be to gather the requirements, which will ultimately affect the quality of the product or service and make it even more difficult to

come up with a TQM framework that is fit for purpose. Therefore, it is of utmost importance to review the existing procedure, and if the quality is not employed as a "totality concept", then make sure to deploy in all sections and department with a review process in place to achieve continuous improvement cycle.

If the quality implementation is patchy and not uniformly functional in all sections and department, then in case of time-constrained projects and events with diverse customer character set, it will be difficult to set the agreed customer requirements. In this case a mechanism will be required to minimize the gap between the customers and the development team. A concrete method is required to incorporate the voice of customer in the design. To achieve this goal Quality Function Deployment can be used for developing a design quality, aimed at satisfying the diverse customer requirements, translating the customer demands into design targets and major quality assurance point to be used throughout the production phase or/and processes at all levels.

The comprehensive literature review of the TQM concept in Chapter Two covered the main principles, tools, techniques and models of the TQM philosophy. Chapter Three discussed the construction industry in Qatar and critical problems it faced. It was established that the common factors considered critical for the success of TQM implementation are: management commitment, customer satisfaction, and training. However, cost, quality, and duration of projects are the three parameters in the view of clients who considered the enduring problems of construction companies in Qatar. Chapter Four discussed the methodology used in the study, with the focus on the descriptive method based on the reality of the phenomenon. Chapters Five and Six discussed analysis of both the interviews and questionnaires.

After analysing the results that were obtained through primary and secondary data collected as a part of this study, it became apparent that there is only one department in whole of the client's organisation, who are familiar with the TQM philosophy. The other departments in the organization need to understand, what the TQM can bring to the organisation, i.e., how the processes and procedures can be standardised to streamline the working processes. It may be more precise to say that the employee(s) are familiar with the quality issues (QA/QC) but the concept of TQM, which is taken as a "totality" concept does not exist. It needs to be designed, implemented and more importantly, the

employer needs to make the employee aware of the benefits it can bring to the working ethics, make life easy for everyone, rather than becoming a barrier. In general, the findings of this thesis suggest that the TQM can be successfully implemented in construction companies in Qatar.

8.3 Recommendations

One of the goals of this study was to emphasise the importance of Quality Function Deployment for effective project and quality management. The framework suggests a proposed model for integration of QFD team with in the development phase to bridge the gap between the customer and the client (industry) and to ensure right first time development of the product or service.

The researcher has successfully answered the following questions in this study:

1. How to successfully deploy the quality function through all sections and departments
2. How the structure of the quality function deployment be achieved at all levels
3. What are the effects of cultural issues within the quality framework?
4. What should be the appropriate quality assurance methodology to ensure quality in a real time constraint project?
5. What will be the effect of resource allocation and backlogging on the quality?
6. How to mitigate “Throw It Over the Wall Approach”? and get it right first time by identifying the barriers that are hindering the processes.
7. What are the potential barriers in ensuring quality at all levels and what should be the appropriate strategy?

As the research was more focused on ensuring quality at all levels and ensuring to get it right first time, development of TQM framework and detailed analysis of the data gathering methodology was required. The researcher carried out comprehensive interviews with the aim to identify time constraint that may exist in project and compromise quality at the end. After collecting all the data, the researcher followed it by processing it and linked it up with the hypothesis of this study. Under the light of

hypothesis, the researcher developed the TQM framework that has been suggested for implementation.

In particular, the processing of the data indicated that the processes of the client required streamlining with particular emphasis especially on the quality management throughout the organisation.

It is envisaged that deployment of Quality functions at all levels will be a good starting point for the client and the collected data also dictated that there is a dire need to address the training aspects of both the individuals and team at all levels .

Therefore, it is suggested that the following functions are strongly implemented within the TQM framework:

1. Buy In from Senior Management

Senior management should be convinced about the use of TQM as a process improvement methodology for "Issue Resolution Process". The management should be convinced to support the initiative and communicated the returns on investment made in the training and development cost for this project. The Director of the company (client) should take personal interest in TQM functions deployment and lead from the front providing guidance and support.

2. Selecting the Team

A team of highly motivated and talented professionals should be selected to work as Champions or supervising scientists. Special incentives should be given to the selected team members.

The concept of either on-job or before the job training is not that new. Its utility is often been supported by analysts and researchers. Managers have long been trained on the job with little or no formal training within the discipline of project management. Often a manager is promoted to the position based on the individual's technical ability, but he or she is lacking the necessary cross-functional team manager skills. An alarming fact in a

management is the lack of training or type of management training a manger receives prior to taking on their management responsibilities.

3. Training

The selected team should be put through a rigorous training program at different levels. Renowned consultants / experts from academia should be hired to train the team on the concepts of operations of TQM. The consultants/experts will help in drafting the Critical parameters to Quality features that are specific to the need of company, hence, defining a system that is fit for purpose and addresses the quality at all levels. It is extremely important that manager training should be based on the competencies required for success of the processes that are defined to fulfil the quality functions.

The team members should also be trained on different areas of Soft skills including Communication, Time Management, Conflict Management and Stress Management etc.

4- Analyze

Once the system is developed and deployed, it is of utmost importance that the gathered data is appropriately analysed using different quality control tools including Control Charts, Pareto Charts and Fish Bone Diagram etc. Observations shall be appropriately recorded at all levels and recommendations should be made for future improvements. The management should be convinced that a process that is fit for purpose is effectively operating at levels of the TQM framework. This will ensure that there is still room for improvement and the TQM framework is geared to achieve excellence in Quality products and Service at all levels, hence, increasing the profitability of company by means of satisfied customers.

5- Control

An effective control mechanism should be designed for monitoring the whole process. A team must be formulated to champion the TQM framework and produce a process that is addressing the continuous improvement cycle. The issues were discussed and action plans were devised to ensure that these incidents don’t happen again, working in preventive

action mode rather than needing to initiate a corrective action plan at each non-conformity identified. A knowledge base should also be maintained for future references.

In closing, the dedication of the senior management results in the success of TQM implementation during the processes. The lessons learnt during the implementation of TQM framework need to be fully documented and evaluated systematically. The service level agreements should be met at all levels, which will result in higher customer satisfaction and increased employee moral. The whole team will work dedicatedly to raise the quality level hence the profitability.

Construction Industry in Qatar is growing at a rapid pace and it is the need of the hour that a thorough methodology is used for delivering the Quality of Service and products. Based on the both the results and the conclusions drawn from the study, the following recommendations are proposed in relation to the organisation of the client's construction company.

- It appears that the job descriptions stated in the client company documents do not describe the actual job which is carried out in practice. Therefore, a non-conformity may be raised which will require both corrective action and preventive action plan to be put in place. It is suggested that the company documents should be modified by taking into account the exact role of the person or personnel doing the job, all of whom should be trained to perform their role according to the defined standard operating procedure clearly set out in company documents.

- It is strongly envisaged that the training of a new employee is of utmost importance to the success of the company. Therefore, it is recommended that the recruitment process be streamlined and a standard operating procedure espousing different ways of recruitment should be put in place. It may well be that different types of recruitment methods are required for different departments of the company. It is believed that this process will help in improving the quality of people who are recruited to specific jobs in the company.

- The shared culture between management and employees avoids misunderstanding when it comes to instructions while facilitating a two –way dialogue between management and employees. Therefore, it is recommended that a common language such as English be used in communication among employees. Although, it is difficult to communicate in English especially at the labourer's level, it is recommended to choose a labourer who can speak English in addition to his/her mother tongue as leader of a group of labourers and his responsibility will be to transfer the managers' instructions to the labourers. Furthermore, communication skills of the group leader should be enhanced by recommending him to communication skill courses.

- Understanding the concept of quality is not enough for meeting customer requirements. Therefore, it is important that the client's construction company should focus so as to understand their processes and end results which can be achieved by creating systematic processes for their activities that in turn facilitates achieving the quality that meets customers' requirements.

- The lack of monitoring standard operating procedures and bureaucratic processes act as a barrier to progress at different stages and there is a need here to streamline these processes. Therefore, it is suggested that a quality control section be activated to monitor and control the company processes. It is also recommended that bureaucracy be avoided by minimizing the stages of implementation to daily activities and by focusing on the critical stages that might help to speed up the processes without ignoring the quality of the outputs.

- It appears that employees are afraid to complain or suggest anything to the upper management due to fears of losing their job. Therefore, it is essential to understand that the management's role is to reduce such fear and provide a safer environment for their employees to openly suggest and propose their opinions. This could be done by providing complains and suggestions boxes to allow employees or workers to express their complaints and suggestions without identifying their identity.

- Understanding and diffusing an awareness of the concept of TQM is essential and is to be considered as a critical first stage if the organisation is successfully adopt the

TQM philosophy. Therefore, it is recommended that the concept of TQM be propagated within the organisation and among employees by providing suitable training that focuses on the importance of the concept of TQM.

- The top management structure requires overhauling, since top management is very often not qualified to even understand the exact processes due in part to an inadequate qualification. Therefore, it is recommended that the top management be more educated and should continually update their knowledge by attending training courses that especially focus on the quality management concepts.

- The unwillingness of employees to seek improvement is due to a misunderstanding of the benefit of improvement and the fear of change. Therefore, it is recommended that employees be informed of any changes the company intends to make with a clear description of the aim of the improvement and the benefit employees will gain from this improvement or changes before being ordered to implement them.

- The kind and quality of training needs reviewing to meet the requirements of the company activities, as a lack of attention given to training detracts from improving quality implementation. Therefore, it is suggested that training courses selection be kept as one of the development manager's responsibilities who will decide the type and the people to attend training courses rather than having employees making such crucial decisions.

8.4 Future Research

This research advocates the importance of implementing the TQM philosophy among Qatar's construction companies. In light of the findings, there is an urgent need to propose key areas of research for the advancement of the construction industry in Qatar. The most important research topics proposed are the following:

1. A comparative study on the implementation of TQM among construction companies in Qatar, Japan and USA.
2. The development of an effective training programme for construction companies in Qatar.

3. The benefits of introducing the concept of self-monitoring among employees of construction companies in Qatar.
4. The communication barrier among construction companies in Qatar (problems and solutions).
5. The development of strategic planning in terms of recruitment methods for Qatar's construction companies in light of the concept of TQM.

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Appendices:

Appendix (A): Criteria for Classification of the Construction Companies in the State of Qatar

Part One: Elements and Points

First: Financial situation, (15) points distributed as follow:

- The Capital in (QR),$ 1= QR 3.65

Allocated (5) points, (1) point for each Million in (QR).

2- Fixed Assets

Allocated (10) points, (1) point for each Million in (QR).

a) The contractors with grades of (A), (B), (C), or (D), as a basic condition must confirm their capital and financial situation from the Commercial Registry Office, and authorised external auditor. However contractors with grades of (E) and (F) are accepted from auditing.
b) Allocated points for capital and fixed assists will be added to the contractors with grades (E) and (F) if they are submitting their financial situation from an authorised auditor.
c) If there are any differences between the capital which is mentioned in commercial registry and the capital which is mentioned in the Auditing Balance Sheet, the lowest amount will be considered.

3- The lower limits for financial situation

a) Grade (A) (10) points out of (15) points
b) Grade (B) (8) points out of (15) points
c) Grade (C) (6) points out of (15) points

Second: Managements: (15) points distributed as follow:

1- The first management level

Allocated (5) points, (2.5) points per person:

a) This level includes the Chairman of the Board, Managing Director and Department Managers.
b) Pre-requisites are to obtain a university qualification and above in addition to ten years' experience in the construction field and that for non-Qatari nationality holders.
c) Qatari nationality holders are exempt from the degree requirement in the case of full time attendance; in the case of absence of a full-time attendance, citizenship holders are granted half a point and a maximum of only one person with the condition of fulfilling the requirement of reaching the legal age.
d) For a person who is not a citizen, a documented biography must be attached with the application.

2- The second management level

Allocated (5) points, (1) point for each person

a) The points are distributed by (1) point per person up to a maximum of (5) people.
b) Heads of department and senior staff with high qualifications are included in this level.
c) A suitable university qualification is required in addition to the seven years' experience in the area of specialisation.

3- The third management level

Allocated (2) points, (1) point for (5) people

a) The points are distributed as (1) point per (5) people and a maximum of (10) people.
b) This level is devoted to juniors, such as clerks, and secretaries.

4- The administrative citizen

Allocated (3) points

a) The citizens gain an additional (1) point for every person with a maximum of (3) points in any of the management levels mentioned above, subject to the availability of high degree in level one and two, while third level is subject to availability of preparatory qualification. In any case full time attendance is required.

b) The citizen must submit a release certificate certified by the Ministry of Civil Service and Housing in addition to the certified employment contract.

General Conditions:

- It is required that non-citizens at the first or second management levels provide a certified copy of their certifications and that this is approved by the Foreign Affairs Office of the state of Qatar and provide the original certificate for consultation.
- A contractor in categories (A), (B), and (C) in all disciplines, must provide an organisational chart clarifying the management structure of the institution or company and the distribution of the powers and responsibilities of all administrative levels.
- A citizen must provide a certified certification for his/ her degree and provide the original copy for consultation.

Third: The Technical Staff: (30) points distributed as follow:

1- The professionals: (10) points are devoted to this component accorded as follows

a) Head of engineers, and devoted to him (2) points. Bachelor's degree in Civil or Architecture or Mechanical Engineering in addition to (10) year's experience for non-citizens and (5) years of experience for citizens with the condition that full time attendance is required for this position.

B) Engineers:

- A Bachelor's degree is required in any of the engineering fields mentioned above.
- For this part, (6) points are devoted as follows:
  - ◊ For each engineer with five years' experience and above (1) point is accorded, and (2) points for citizen engineer with the full time attendance.
  - ◊ In the case of multiple disciplines, the contractor is required to provide at least one specialist engineer for each specialty with a minimum of five years' experience, citizen engineers are exempt from the experience requirement.
  - ◊ A person may be accepted who has a civil or architectural engineering diploma in addition to the ten years' experience as a building engineer and only in grade (F). The same may also be accepted in other grades up to a maximum of two people if a contractor has another civil or architect engineer holds a Bachelor's degree.
  - ◊ To be classified in the (A) grade of building, the contractor must have at least (5) engineers, and (3) engineers for other specialises.
  - ◊ To be classified in the (B) grade of building, the contractor must have at least (4) engineers, and (2) engineers for other specialises.
  - ◊ To be classified in the (C) grade of building, the contractor must have at least (3) engineers.

C) The Quantity Surveyor, and allocated to him (1) point

- ◊ This point is distributed on the basis of (1) point for each quantity surveyor.
- ◊ A Bachelor's degree in civil, architectural engineering or Quantity Surveyor (QS) in addition to five years experience is required.
- ◊ For grades (A) and (B), the availability of Quantity Surveyors is a prerequisite for classification in all disciplines.

D) The Surveyors, and allocated to him (1) point

- ◊ The points are distributed on the basis of (1) point for each surveyor.
- ◊ For grades (A) and (B), the availability of a Surveyor with at least five years' experience, in addition to a diploma in surveying is prerequisite for a classification in all disciplines.

E) Planning (projects programming) and allocated to him (2) points as follows:

- ◊ One point for a senior planner, who must have (5) years' experience after his Bachelor's degree.
- ◊ One point is distributed for four planners on the basis of (1/4) point for each person, who must have at least (3) years' experience after a Bachelor's degree.
- ◊ In any case the contractor with grade (A) must have at least one senior planner and two planners. For grade (B), the contractor must have at least one senior planner who meets the above condition.

F) Quality Control and allocated to him (2) points distributed as follows:

- ◊ One point for senior quality control, and must have (5) years' experience after his Bachelor's degree.
- ◊ One point is distributed for four quality control areas on the basis of (1/4) point for each person, and they must have at least (3) years' experience after their Bachelor's degree.
- ◊ In all cases, the contractor with grade (A) must have at least one senior quality control and one junior quality control. For grades (B) and (C), the contractor must have at least one senior quality control who meets the above condition.

G) Security and Safety officers and allocated to him (1) point distributed as follows:

- ◊ Half a point for senior Security and Safety officer, who must have (5) years' experience after his Bachelor degree.
- ◊ Half a point is distributed on the basis of (1/8) points for each person up to a maximum of 4 persons, and they must have at least (5) years' experience with a suitable degree.
- ◊ In all cases, the contractor with grade (A), (B) and (C) must have at least one senior Security and Safety officer.

General Conditions:

- A copy of the academic certificates is required, and must be formally documented. Moreover, the committee have the right to the equivalency of the certificate if warranted.
- A copy of the passport with valid dates; personal sponsors' guarantees are not accepted, except in the case of individual institutions.
- A Qatari Engineer must provide the release certificate.

2- The professionals and allocated to them (15) points, distributed as follow:

a) Foreman or workers' observer, and allocated for them (3) points on the basis of (1/2) point for each Foreman.

b) Skilled labourers and allocated for them (6) points on the basis of (1) point per (10) people.

c) Unskilled workers and allocated for them (6) points on the basis on (1) point per (15) people.

Fourth: The Equipment and Machinery (Buildings, Roads, Drainage, Water)

1- Buildings Specialisation (10) points:

◊ Excavators, and allocated (2) points – on the basis of (1) point per (2) Excavators.
◊ Loaders, and allocated (2) points- on the basis of (1) point per (2) Loaders.
◊ Heavy vehicles, and allocated (2) points- on the basis of (1) point per (4) trucks.
◊ Light transport cars, and allocated (2) points- in the basis of (1) points per (8) cars.
◊ Tower Crane, and allocated (3) points- in the basis of (3) points per each.
◊ The minimum points required for grade (A) is (5) points

2- Drainage and Water (27) points:

◊ Excavators and allocated (8) points on the basis of (1) point per one Excavator.
◊ Loaders and allocated (3) points- on the basis of (1) point per two Loaders.

◊ (JCP) Excavator and allocated (2) points on the basis of (1) point per two Excavators.

◊ Heavy transport vehicles and allocated (4) points- on the basis of (1) point per one truck.

◊ Diesel water pump and allocated (3) points- on the basis of (1) point per four pumps.

◊ Rollers and allocated (3) points- on the basis of (1) point per four small Rollers and (1) point per (2) large Rollers.

◊ Car with lifter and allocated (2) points- on the basis of (1) point per each.

◊ The minimum points required for grade (A) is (17) points and (12) points for grade (B).

3- Road Works (27) points:

◊ Excavators, and allocated (1) points on the basis of (1) point per four Excavators.

◊ Loaders, and allocated (2) points- on the basis of (1) point per three Loaders.

◊ Bulldozer, and allocated (4) points on the basis of (1) point per one Bulldozer.

◊ Trucks, and allocated (2) points- on the basis of (1) point per four trucks.

◊ Asphalt plant, and allocated (4) points- on the basis of (4) points per each plant (not less than 60 Ton /hour).

◊ Rollers and allocated (5) points- on the basis of (1) point per four Rollers, more than 10 T

◊ Motor Graders, and allocated (4) points- on the basis of (1) point per two graders.

◊ Oil Spraying vehicles and allocated (1) point- on the basis of (1) point per each.

◊ The minimum points required for grade (A) is (17) points and (12) points for grade (B).

General Conditions:

- The equipment and machinery points are distributed in different disciplines in according to the above.
- The availability of minimum numbers of pieces of equipment of the contractor is required to be classified, with a focus on trucks and heavy equipment.

- All equipment and machinery must be submitted with a form of valid ownership, in addition to which the contractor must provide a certificate from an external auditor in approval for all fixed equipment.
- The committee has a right to consult the relevant departments on the assessment of the equipment for the grades (A) and (B) only.

Fifth: The Past Experience and Quality Performance

1- Building specialisation: (30) points are distributed to the following sub-components:

a) The value of projects within the State of Qatar during the preceding five years. This element has (15) points, devoted to it, based on (1) point for each five million QR. Therefore, the value calculated as full points for government or semi government projects and projects for companies are those listed on the securities market, while for private projects (2/3) of the project value will be calculated.

b) The number of projects implemented during the last five years has been allocated (5) points on the basis of (1/2) point for each project, with the condition of the value of a government or semi-government project and the projects owned by the companies listed on the securities market should be not less than QR250 thousand and not less than QR 500 thousand for private projects.

c) The overall average of the projects implemented during the preceding five years will have (10) points, based on (1) point per million. This means the average value for a project in the last five years in accordance with those mentioned in term (a) divided by the number of projects.

2- Roads, Drainage and Water specialisations: (13) points distributed to the following sub-components:

a) The value of projects within the State of Qatar during the preceding five years. This element has (8) points, devoted to it, on the basis of (1) point for each QR 5 million.

b) The overall average of the projects implemented during the preceding five years will have (5) points, on the basis of (1) point per QR 2 million.

Note: All past projects must be documented by providing the contracts for each project implemented and completion certificates for completed projects.

Part Two: Financial criteria and limitation of the all categories:

1- Building Specialisation

Grades	Points limitation (points)	Project value limitation. QR Million
A	81-100	30 – 100
B	66 – 80	10 – 30
C	51 – 65	3 – 10
D	36 – 50	1 – 3
E	15 – 35	0.35 – 1
F	5 – 14	Up to 0.35

2- Building Maintenance Specialisation

Grades	Project value limitation. QR Million
A	2 – 10
B	> 2
C	>1/2 – 1
D	> 1/4 – ½
E	< ¼

3- Roads, Drainage and Water Specialisation

Grades	Points limitation (points)	Project value limitation. QR Million
A	76-100	10 – 70
B	46 – 75	3 – 10
C	31 – 45	1 – 3
D	15 – 30	Up to 1

Appendix (B): List of Classified Construction Companies in the State of Qatar

S	Contractor's Name	Grades
1	AL DARWISH ENGIERING	A
2	HBK CONTRACTING COMPANY	A
3	QATAR BUILDING CO.	A
4	ALTEYSEER CONTRACTING COMPANY(W.L.L)	A
5	CONSTRUCTION ENTERPRISES CO.	A
6	LOTUS TRADING & CONTRACTING CO	A
7	TRADING & AGENCY SERVICES LTD CO.	A
8	SHANNON TRAD $ CONT CO	A
9	CONTRACO	A
10	AL MANA ENGINEERIN & CONT 0CO	A
11	AL-HUDA ENGINEERING WORKS	A
12	GETTCO CONTRACTING SERVICES	A
13	A.B.K CONT LTD.	A
14	GALFAR AL MISNAD ENGG & CONTG	A
15	ORIENTALS ENTERPISES CO	A
16	REDCO CONSTRUCTION CO	A
17	AL-JABER TRADING & CONTG	A
18	SALEM BIN HASSAN AL-ANSARI & SONS CO.	B
19	MOHAMED JASSEM AL-KUWARI&SONS CONT	B
20	AMANA STEEI BIULDINGS CONTRACTING CO	B
21	NOORS ENGINEERIN COMPANY	B
22	AL ZUKHROF TRAD & CONT CO.	B
23	TALAL TRADG & CONTG CO.	B
24	NATIONAL CONTRACTING TRADING CO	C
25	MOHD YOUSUF KAFOOD & SONSTRADING	C
26	BARADA CONT.COM	D
27	AL-KHALEEJ MODERN LIGHT CO	D
28	ALFOWRIYA TRAD & CONT CO	D
29	SOUTH TRADING & CONTRACTING CO.	D
30	MOHAMED SCOMPANY FOR TRADE & CONTRACT	D

31	AL WAIAYA CONTRACTIN & TRADING CO.	D
32	HAMAD BIN KHALIFA CO TRADING	D
33	AL AKHARIA TRAD & CONT CO	D
34	ABDULNOOR SAIFALDEEN TRAD & CONT W.L. L	D
35	QATARI ENGINEERING BUSINESS CO	D
36	ROCK TRADING & CONTRACTING CO.	D
37	BUILD IT CONSTRUCTION CO	D
38	UNION QATAR CO.	D
39	YOUSEF AHMED JAMAL CONT EST.	E
40	ALKHAYAT TRAD & CONT EST.	E
41	AL-ME`MAR TRADING&CONT.CO	E
42	AL-DARWISH CONT CO	E
43	ALMANA TRAD. IN& & CONTEST	E
44	AL-KHOLAIFI CONT & TRADING	E
45	AL- AFIF TRAD & CONT EST	E
46	AL-HAMMADI TRAD & CONT.EST	E
47	BIN JAFFAL TRAD & CONT CO	E
48	GOLEN GATE CONRACTING & TRAONG	E
49	ARABIC BUILDING TRADING&CONT.EST.	E
50	ENGINEERING CONSTRUCTION CO	E
51	NEW CENTRE TRADING&ENGINEERING SERVICES	E
52	AL SHHAMA TRAD & CONT CO	E
53	MODERN BUILNG ENGINEERING CONT CO	E
54	AL HAZAN TRADING & CONTG CO	E
55	KHALID INTERNATIONAL TRAD & CONT CO.	E
56	AL-AMODI TRADING&CONT	E
57	AL-TALYA TRAD.& CONT.CO	E
58	AL FAY TRAD & CONT CO.	E
59	AL MAJED TRAD & CONT	E
60	TARMEEM TRADING & CONT. CO.	E
61	ALMANSOOR ENGINEERING	E
62	AL-MANSOURI CONSULTANTS CONS CO	E

63	A . B . S TRAD & CONT CO	E
64	BALSAM TRADING&CONTRACTING.CO	E
65	MIDDLE EAST CO.FOR CONT.& URBAN DEVELOPMENT	E
66	RASHID TRADING & CONTRACTING GROUP	E
67	MAKKAH INTEGATINFG CONT. CO.	E
68	AL WAJDAN TRADING & CONTRACTHNG COMPANY	E
69	DANA TRADING & CONTRACTING	E
70	Q LINE TRAD & CONT	E
71	DOHA DEVELOPMENT CO	E
72	MASTER ENG. SERVICES	E
73	QATAR ENGINEERING ENTERPRISES CO	E
74	GRAND TRAD & CONT CO	E
75	AIN SHAMS ENG.CO.	E
76	JYKCO TRADING CONTRACTING CO.	E
77	MUBARAK GHNEM AL-BARGASH TRAD&CONT EST	E
78	CLEAR VISION TRAD & CONT CO	E
79	ARABISC TRAD $ CONT EST	E
80	UNITED BUILDING DCTC W.L.L	E
81	ALQMA ENGINEERING & CONT	E
82	AL-FAJER INTERNATIONAL TRADING	E
83	MIDDLE EAST MARBLE TRAD & CONT	E
84	MOHAMMED RASHID AL-BINALI CO	E
85	MOHAMAD & NASER TRAD & CONT CO	E
86	KHALID AHMED ALMAS TRAD & CONT CO	F
87	DOHA BEARI TRADINA &CONTRACTING CO W.L.L	F
88	ABNA ALJAZIRA CAR, TRAD & CONT	F
89	NAYEF AL-SHAHRANI TRAD&CONTRACTING	F
90	DIRECDIONS W.L.L	F
91	AL-SAFI TRAD & CONT CO	F
92	ALPHA GULF FOR CONST. & DEVEL.	F
93	ALBORSHID CONT & MAINTENANCE	F
94	BROTHER GROUP CONT	F

Appendix (C): Chi Square Table

df	P = 0.05	P = 0.01	P = 0.001
1	3.84	6.64	10.83
2	5.99	9.21	13.82
3	7.82	11.35	16.27
4	9.49	13.28	18.47
5	11.07	15.09	20.52
6	12.59	16.81	22.46
7	14.07	18.48	24.32
8	15.51	20.09	26.13
9	16.92	21.67	27.88
10	18.31	23.21	29.59
11	19.68	24.73	31.26
12	21.03	26.22	32.91
13	22.36	27.69	34.53
14	23.69	29.14	36.12
15	25.00	30.58	37.70
16	26.30	32.00	39.25
17	27.59	33.41	40.79
18	28.87	34.81	42.31
19	30.14	36.19	43.82
20	31.41	37.57	45.32
21	32.67	38.93	46.80
22	33.92	40.29	48.27
23	35.17	41.64	49.73
24	36.42	42.98	51.18
25	37.65	44.31	52.62
26	38.89	45.64	54.05
27	40.11	46.96	55.48
28	41.34	48.28	56.89
29	42.56	49.59	58.30
30	43.77	50.89	59.70
31	44.99	52.19	61.10
32	46.19	53.49	62.49
33	47.40	54.78	63.87
34	48.60	56.06	65.25
35	49.80	57.34	66.62
36	51.00	58.62	67.99
37	52.19	59.89	69.35
38	53.38	61.16	70.71
39	54.57	62.43	72.06
40	55.76	63.69	73.41
41	56.94	64.95	74.75
42	58.12	66.21	76.09
43	59.30	67.46	77.42

44	60.48	68.71	78.75
45	61.66	69.96	80.08
46	62.83	71.20	81.40
47	64.00	72.44	82.72
48	65.17	73.68	84.03
49	66.34	74.92	85.35
50	67.51	76.15	86.66
51	68.67	77.39	87.97
52	69.83	78.62	89.27
53	70.99	79.84	90.57
54	72.15	81.07	91.88
55	73.31	82.29	93.17
56	74.47	83.52	94.47
57	75.62	84.73	95.75
58	76.78	85.95	97.03
59	77.93	87.17	98.34
60	79.08	88.38	99.62
61	80.23	89.59	100.88
62	81.38	90.80	102.15
63	82.53	92.01	103.46
64	83.68	93.22	104.72
65	84.82	94.42	105.97
66	85.97	95.63	107.26
67	87.11	96.83	108.54
68	88.25	98.03	109.79
69	89.39	99.23	111.06
70	90.53	100.42	112.31
71	91.67	101.62	113.56
72	92.81	102.82	114.84
73	93.95	104.01	116.08
74	95.08	105.20	117.35
75	96.22	106.39	118.60
76	97.35	107.58	119.85
77	98.49	108.77	121.11
78	99.62	109.96	122.36
79	100.75	111.15	123.60
80	101.88	112.33	124.84
81	103.01	113.51	126.09
82	104.14	114.70	127.33
83	105.27	115.88	128.57
84	106.40	117.06	129.80
85	107.52	118.24	131.04
86	108.65	119.41	132.28
87	109.77	120.59	133.51
88	110.90	121.77	134.74
89	112.02	122.94	135.96
90	113.15	124.12	137.19
91	114.27	125.29	138.45

92	115.39	126.46	139.66
93	116.51	127.63	140.90
94	117.63	128.80	142.12
95	118.75	129.97	143.32
96	119.87	131.14	144.55
97	120.99	132.31	145.78
98	122.11	133.47	146.99
99	123.23	134.64	148.21
100	124.34	135.81	149.48

A List of Abbreviations:

5S (Sort – Set in order – Shine – Standardize – Sustain) is translated from Japanese words such as Seiri – Seiton – Seiso – Seiketsu – Shitsuke.

BS: British Standards

CI: Continuous Improvement

CTC: Central Tender Committee

DMAIC: Define – measure – Analyse – Improve - Control

EFQM: European Foundation of Quality Model

ISO: International Standards Organization

KPRs: Key Performance Results

PDCA: Plan –Do – Check – Act

QA: Quality Assurance

QC: Quality Control

QHSE: Quality – Health – Safety – Environment.

SME's: Small Medium Enterprises

SPC: Statistical Process Control

SPSS: Statistical Package for the Social Sciences

TQM: Total Quality Management